Rock Garden Primer

By Archie Thornton

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REFLECTIONS

A construction of rock and water garden combined which could be built in the average suburban garden

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ROCK GARDEN PRIMER

By

ARCHIE THORNTON

WITH DIAGRAMS BY THE AUTHOR

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DEDICATED

TO

EVERY PROSPECTIVE
ROCK GARDEN
BUILDER

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Author's Preface

ROCK gardening in the temperate regions of America has not been written upon so extensively as to exhaust the subject, therefore a further volume of helpful hints for the lover of rock plants may be acceptable.

It is my earnest hope that the contents of this book will prove of aid to anyone who contemplates the possession of a rock garden, regardless of its dimensions; and it has been my aim, both in text and in illustration, to express the results of practical experience in a manner that may be clearly followed by the reader and bring to him a gratifying measure of success.

This work has not been accomplished without the fortunate help of those to whom I owe a debt of gratitude. I wish particularly to thank Mr. A. T. De La Mare, the editor, for his unfailing encouragement during my preparation of these pages and for the contribution of valuable photographs. My grateful thanks are also due to Mr. Herbert W. Gleason of Boston, for furnishing most of the photographs of individual plants, and to Mr. John Scheepers of New York, for loan of the illustrations of Narcissus triandrus albus and N. cyclamineus.

The use of capitals and small letters in the spelling of plant names is that adopted by "Standardized Plant Names."

ARCHIE THORNTON

Chestnut Hill, Mass.

Introduction

THAT rock gardening is becoming more popular each year is evidenced by the numerous inquiries as to how one should plan to construct a rock garden, what amount of ground is necessary, and hosts of other questions that the beginner might reasonably ask.

There is much to commend the popularity of rock gardening. A considerable amount of ground is NOT necessary for one to be in possession of a rock garden; its building is an interesting diversion and not beyond the means of the average garden enthusiast, while its upkeep does not amount to much after the first cost is overcome, the expense of procuring plants of a more Alpine character evolving with the enthusiasm of the rock gardener.

Further, no limited area devoted to other phases of gardening can yield an equal amount of interest, for the inhabitants of a rock garden are so diverse in character that they contribute flowers or attractive foliage for the greater part of the year.

Even with such variable climatic conditions as are experienced in sections of the Western Hemisphere, there is sufficient hardy plant material to warrant one constructing a rock garden—and in no form of a venture.

Upon commencing a rock garden, too much should not be attempted either in the way of construction or in the choice of plants whose hardiness has not been proved in the particular locality intended for their habitation. Plan to have the construction as simple as possible, taking into consideration the importance of drainage and the placing of rocks to give the appearance that after long ages their faces have become exposed.

Only in recent years has rock gardening in America come to the fore, while in Europe its value in garden architecture has

been recognized for the past quarter of a century, with its popularity constantly increasing. This manifest difference is possibly due to the extremely severe Winters of the northern United States; and perhaps one who would be glad to have a rock garden is left wondering what plants will survive the cold season.

Therefore one might consider that the plants contributing the greater part of the beauty en masse to the European rock gardens are numbered among those able to survive our cold Winters if given the protection of a slight covering of salt hay or similar light material.

All plants will not require Winter protection, their hardiness being a question relative to altitude and latitude. Those plants requiring protection in Massachusetts would probably survive the Winter in New York state, while in the State of Pennsylvania and in Washington, D. C., only a few subjects would require Winter protection.

However, in the more northerly States where lower night temperatures prevail, where rains are more frequent, and near the ocean where fogs are more common than inland, many of the most charming rock plants thrive the best, thus emphasizing the suggestion that the character of material for rock gardens must vary considerably according to latitude.

Phlox subulata, Aubrietias, Alyssums, Arabis, Dianthus, Papavers, Saxifragas lantoscana and macnabiana, Gypsophilas cerastioides and repens, Campanula pusilla, C. pusilla alba, C. portenschlagiana, C. garganica, C. carpatica and C. carpatica turbinata are all showy plants and may be grown with a certainty of their surviving the Winter.

Rock gardens will gain their deservedly prominent place in American horticulture, with no inconspicuous rôle to play in garden architecture, when the inhabitants thereof are better understood as to their individual likes, and dislikes, and the construction of their homes.

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Boston, Mass.

Chapter I

Choice of a Site for a Rock Garden

IT would seem appropriate in a work of this nature, solely written to meet the requirements of the beginner, to start out by suggesting the various situations on which a rock garden may be built. One of the sites suggested might be most convenient for the would-be rock gardener to make a beginning. Then, following, would come the necessary materials, such as rocks, soils, drainage, and so on, finally leading up to the actual construction in different situations.

The selection of a natural and suitable site for a rock garden has an importance, but may not be strictly adhered to, for the majority of gardens are limited in extent. To determine an ideal situation would be out of the question; therefore, with the desire for a small rock garden, the enthusiast will make the most of the chances presented.

It is generally thought by the beginner that a rock garden must be situated on a steep slope or undulating bank. That is an erroneous idea and has probably come about through nurserymen constantly exhibiting rock gardens in that manner at the various floral exhibitions. If one is blessed with either of the previously mentioned situations, so much the better. In the case of the undulating bank, there is no limit to the interesting feature that a rock garden can be made.

Light and a free circulation of air are important factors to be considered in making a choice of situation. Even with these elements in view, it should be no difficult task for one to choose a site where the general run of rock plants will thrive exceedingly well in so far as environment be concerned.

A background gives stability and delightful repose to the rock garden

The situation—a gradually sloping bank—might naturally exist in one's garden, or could be built up from ground level, and where such a picturesque background is presented, it should be given consideration as the prospective site for a rock garden. Note the rocks partially protruding from the earth, with their stratification running horizontally

Where the site presents a background of natural greenery it should be given favorable consideration. Such an instance is often seen in a comparatively small garden where a background of shrubs or climbers has been used to hide a fence marking the boundary line or the like.

It would be necessary for the actual rock garden to be some distance from the shrubs. Should the ground available be limited, the gardener might consider placing a few rocks at the base of the shrubs in order that they be included in the general scheme of the rock garden. Although this would not add to the actual planting space, it gives a continuity of rock and is pleasing to the general appearance.

Should the reader choose a site in close proximity to flowering shrubs, he should ascertain whether or not the roots are likely to penetrate the rock garden and become a source of annoyance owing to suckering.

In such cases where a site in the open and on level ground is chosen, it seems that the beginner is invariably in difficulty as to how he should make a background. A background of flowering shrubs or evergreens is not always necessary, and, where ground is limited, reduces one's building space considerably.

If the desire is to have evergreens included, then they might be planted on the actual rock garden, but care should be taken in making a selection, and only those varieties of a slow-growing nature chosen.

Should the site in the open and on level ground have but one approach, probably for reason of its being located at one of the extreme parts of the garden, then a background would be of advantage. The background gives stability and adds to the general appearance, even in the case of a small rock garden and where only one view is taken.

Banks and other prominences afford a good opportunity to construct a rock garden, and in many cases the shape of the prominence is altogether desirable and can be considered the formation of the rock garden for general outline.

In some cases, however, the bank, instead of rising gradually as would be desired, might ascend steeply. This can be rectified

in the course of construction by excavating to give the required contour. Where it is necessary that the grade of the bank be retained, the construction of a rock wall might be considered. This is especially attractive when in close proximity to the dwelling-house that stands on high ground and the aspect is a favorable one. The matter of keeping the grass cut on such steep ground is often an irksome task but once a rock wall is built, no further attention is needed, when the building and planting are completed.

Frequently one finds in the larger gardens a low-lying site. Here, then, an opportunity is offered for one to construct a rock garden. Should it so happen that the ground gradually slopes from both sides of the depression, it is probable that a rock and water garden might be combined. Where such a situation is presented, there is no limit to the possibilities of a charming rock garden and, where space permits, the inhabitants can be grown in masses.

A natural clearing in a plantation or wood is an ideal situation for a rock garden, away from other formal parts of the garden and in a natural setting in harmony with nature. In hilly districts a situation of this character is not uncommon, and in many cases the rocks are already there, and for reason of their size and weight would be considered in position.

A disused quarry affords a good field for a rock garden. The occurrence is by no means frequent, but where one is fortunate enough to have access to a situation of this kind there is further opportunity for the builder to design a rock garden on an elaborate scale.

The foregoing suggestions on situations adaptable to the construction of rock gardens will probably accommodate the beginner in one or more instances.

Rock plants might be used to advantage other than in the rock garden proper, planted in an appropriate rock setting.

The pleasures of a herbaceous border can be added to by the inclusion of rock plants set out along the edge. The ground Phlox in its various colors is admirably adapted for this purpose. There are hosts of other genera equally as useful. Plants that

Figure 1—Showing the use of rock plants in an appropriate rock setting along the edge of a herbaceous border

are suited for this purpose are usually earlier to flower than the general run of early herbaceous plants, and so there is an added interest. (See Figure 1.) The surface of the border will be on a level with the top of the rocks, permitting a drop of the rocks' depth to the pathway. Rock plants inserted at the edge of the border will show to good effect trailing over the rocky edge and downward, even extending for a distance on to the pathway itself. (See Figure 1a.)

Figure 1a—Showing surface of herbaceous border on level with rock edging

Figure 2—Rock plants grown on a raised bed around the foot of a bird bath

Another useful way of using rock plants is at the foot of a sun dial or bird bath. (See Figure 2.) Here is an instance where rock plants can be used to advantage. Indeed, a miniature rock bed of no mean order can be made interesting for many months of the year. The ground required need not be more than 12 to 14 feet in diameter, of an irregular outline. In such a small space there is opportunity to grow some of the more interesting rock plants. The collection being small enables each plant to be given individual attention.

Chapter II

Rocks

ROCK plays an important part in the well constructed rock garden. Although not absolutely essential to the culture of the plants, it is of primary consideration in the natural architecture, even in a modest construction.

Rock that has a distinct character, be it weather-worn or stratified, correctly placed as it would be found in nature, is a picture itself without the embellishment of plants.

In districts where there are different types of rock to choose from, the beginner might reasonably ask what one should consider in determining the most suitable rock. To such a question he might be given two answers:

1. From a cultural point of view, a rock that has the absorbent properties to retain sufficient moisture and keep the earth cool in the hot Summer.

2. A type of rock marked for its beauty, stratified or weather-worn, and where showing deep fissures, makes a ready means for the planting of those subjects that like to feel themselves shut tightly in a crevice.

Both characters can be found in a good type of limestone. Where one should choose to use limestone it must be considered that the rock should not be of too soft a nature, or it will hold too much water and through the action of alternate freezing and thawing will crumble.

The charges for transportation of rock are high and in most cases the gardener will make use of the rock that is at hand, and rightly so. The reader must not imagine that, without

Typical weathered limestone

Naturalistic disposition of rock and effective plantings of Saxifraga muscoides, Cheiranthus linifolia and Tiarella cordifolia.

rocks of absorbent properties or weathered so as to be a picture in themselves, he is excluded from having a rock garden. Such an idea is wrong. The mention of it was only to give the ideal rock and its value from a cultural point of view by keeping the earth cool, and weather-worn to beautify the rock garden as a whole.

Rock plants can be successfully grown in any open, light soil, which means more to achieve success than strict limitations on choice of rocks.

One should strictly guard against the use of brick ends, clinkers with cement covering, and ornamental atrocities that are still in evidence in a number of so-called rockeries in America today. It would be far better to grow rock plants on a raised bed without rock substitutes than to resort to the foregoing material.

Probably in most cases the builder will make his choice of rock from that which one often sees on the roadside, in the fields, etc. In stony districts a nicely weathered rock is to be found in woods and undergrowth.

Pieces that can be conveniently handled, of a uniform size and coloring for preference, should be used. A larger rock here and there might be helpful in breaking up the flat appearance. This is especially good in a small garden where to create a pleasing effect taxes the thought of the builder.

The amount of rock to use depends upon the size of the rock garden. To avoid a flattened appearance when the building is completed, the use of larger rocks should be considered.

Flat stone slabs are of little or no value in the construction, apart from their use as stepping-stones. It is difficult, if not impossible, to utilize such with pleasing effect. They are usually only a few inches in thickness and many feet across their surface.

It is not advisable to break pieces off the rock's exposed surface, where it can be avoided, especially in the case of granite; the weathering, which is little more than a coloring, will take considerable time to cover the broken surface.

A soft sandstone is indifferent to being broken and within a reasonable time will weather and show no signs of the treatment.

Chapter III

Drainage and Soils

ALTHOUGH closely allied to construction, drainage and soil are two very important factors in the building of a rock garden, in so far as the cultivation of the plants is concerned, and are worthy of emphasis to the beginner.

To illustrate the importance of drainage and soil, it might suffice to say that the majority of rock plants send out their fibrous roots for an incredible distance into the cool earth. Further, these little plants detest a water-logged soil for their roots to penetrate, which is the result of bad drainage.

The methods of drainage will vary according to the situation. In the case of building from ground level, the excavation for drainage bed should be at least eighteen inches, and even more if the situation be low-lying. Fill in the excavation to about nine inches from ground level, with any material that will render drainage, such as clinkers, brick ends and small pieces of rock. Upon this structure the rock garden will be built.

Where one has chosen a slope or bank, it would in some cases be impossible, and not necessary, to drain from ground level; and in this case excavation would be made deep enough to insure a free passage of water, according to the general contour or ground slope of the situation.

The different compositions of soil to meet the tastes of the various plants will be dealt with later. For the time being we are concerned with the soil that is to form the rock garden in bulk and the general mixture.

The soil used to give the formation of the rock garden in bulk will, for the greater part, be made up from that which was

excavated for drainage bed. It need not be rich in plant foods and will answer the purpose if sufficiently open so as to hold only enough moisture and at the same time not clogging. Upon this soil, which has made the formation of the rock garden, will come the specially mixed soil in which the plants will be inserted, called the general mixture.

A good general mixture for the majority of rock plants, both nutritious and allowing a free root run, would be made up of the following in various proportions: ½ loam, ¼ leafmold, and ¼ coarse sand. To this might be added a quantity of granite chippings. The loam, if in the form of sods, should be broken up with a sharp spade, likewise the leafmold especially if not thoroughly decayed. All these ingredients should be thoroughly mixed together.

In brief, there are three important factors to be remembered:

1. Good drainage bed, made up of any material permitting the passage of excessive water.

2. The soil used in the formation must hold sufficient water and at the same time during wet seasons allow the surplus amount of water to pass through into the drainage bed

3. The general mixture must be at least twelve inches deep, and even deeper would be of great advantage.

These items will be dealt with freely under "Construction," according to the different situations therein reviewed for construction.

Chapter IV

Construction (Building)

HAVING considered the foregoing, the reader will have some knowledge of the requirements necessary in the building of a rock garden.

The rocks and general soil mixture should be taken to some convenient place near the proposed site. Before any actual building is carried out, the gardener should conceive a plan to work by; no matter how simple, it will suffice, if only giving the builder a means to an end.

One's opinion sometimes changes and what is liked today will not appear the same later on, yet the rock garden remains and cannot be transformed without expense and reconstruction. Therefore, no matter how reasonably small the rock garden might be, it is advisable to make a rough sketch in order to visualize what one is trying to create.

The sketch or plan will be entirely dependent upon the individual site and the style of structure that the particular site would call for.

Having sketched our plan, we will proceed to build a beginner's rock garden on a site that presents a background of natural greenery, where the situation is exposed to the full sun, and where, by reason of the background, only one view is possible.

The actual space upon which the rock garden is to be built should be marked out, making the outline somewhat irregular, and avoiding the natural vegetation for some reasonable distance.

The excavation is the next part of the procedure. One should bear in mind whether or not the land is low-lying. Does water

accumulate in the wet season? If so, then the excavation must be deeper than the minimum of eighteen inches. The soil taken from the excavation will be used again for what we have termed the bulk of the rock garden. If the soil is of a tenacious nature, there should be added an amount of chippings and lime to break up the plasticity and render the bulk friable.

Now, what appears to be a hole of irregular outline should be filled in with any material that will afford drainage, such as brick ends, clinkers, and pieces of rock, to about nine inches from ground level.

Upon this rough material a layer of turf, grass downwards, the top of which should be considerably lower than the ground level (about six inches), would be helpful to stop the finer particles from washing away into the drainage bed.

This part of the construction, well carried out, is the beginning of success. Next in procedure is to make the formation of the rock garden on the above described foundation.

The soil that was excavated, and if necessary mixed with chippings, should be heaped on the turf and raked over to give the desired formation, remembering there are at least twelve inches of the general mixture to go on top of this, in which the plants are to be inserted. In the main, the formation of the structure will be dependent upon the actual situation and, further, the amount of ground available.

In the case of the site that we have in view, in the open with a background of natural greenery, little can be done to create any scenic effect by reason of limited ground, but there is no reason why we cannot create something that will be pleasing in its formation and tasteful in the arrangement of the rocks.

Now that the formation has been made, we proceed by covering over with the general mixture to a fairly good depth, at least twelve inches, but not losing sight of our objective in formation. If perchance there has been too much of the good soil mixed, it can be used later.

With this part of the work completed, no further advance can be made until all has thoroughly settled. In case of rain, the settling will not require more than a few days, otherwise a

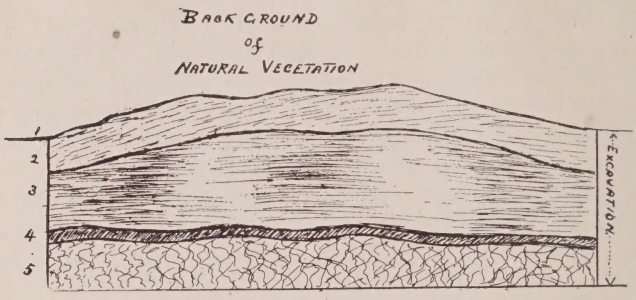


Figure 3—Section through formation of rock garden: 1—Ground level; 2—General mixture of good earth; 3—Earth from excavation; 4—Layer of turf; 5—Drainage bed

longer period will be needed, unless the hose pipe is resorted to. When the mound has settled, it is probable there will be slight depressions, which should be filled in to the level.

Figure 3, as above, will show what has been accomplished thus far.

When all the soil has settled, the placing of the rocks is the next procedure.

The building should start from ground level and work upward. Each rock before being placed in position should be viewed for stratification; this should always run horizontally. Further, and equally important, the natural bend of the rock should be sought, and as the rock was found in nature, it should be placed on the rock garden in like manner. On no account should one rock protrude over the front surface of the one beneath. This is oftentimes done with a view to making a crevice. The plants inserted in the crevice can only die of thirst, for they are excluded from a portion of the rainfall. (See Figure 4.)

Where the rock is to be placed, excavate to allow for the reception of the greater part of the rock, making sure that the earth is perfectly solid, both underneath and behind. Now, the rock placed in the hole should be viewed from different angles at a distance. Most probably the hole will need further excavation into the mound, or the rock require lowering at the front, or some other change will be found necessary.

The aim should be to give each rock a sunken appearance, as if through long ages its face had become exposed.

Figure 5 shows (*A*) each rock fitting firmly into the soil, the strata running horizontally, and the natural inclination of the rock's front view being on the same plane as the mound. The whole of the rock is inclined into the formation of earth, and so the rain, following the course of the rock, is conveyed to the plants' roots.

B is to show how different types of rock might be used to advantage.

1. Is to represent a surface rock, and wherever used, its purpose should be in view, and under no circumstances should be stood on end to represent a boulder.

2. An easy piece of rock to work with. The natural plane of the rock, from front view, should be on the same plane as the ground it is to occupy.

3. A round piece of hard granite and a difficult rock to deal with, in so far as creating any natural beauty is concerned.

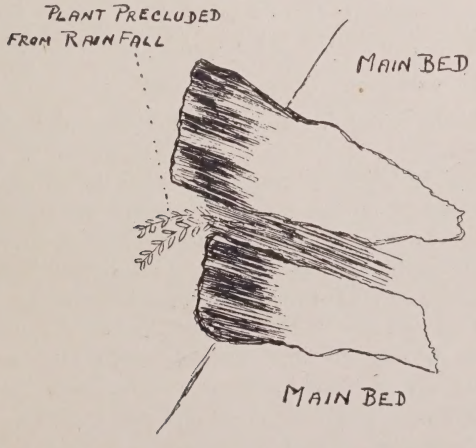


Figure 4—Showing how not to make a crevice. The plants are excluded from any portion of the rainfall

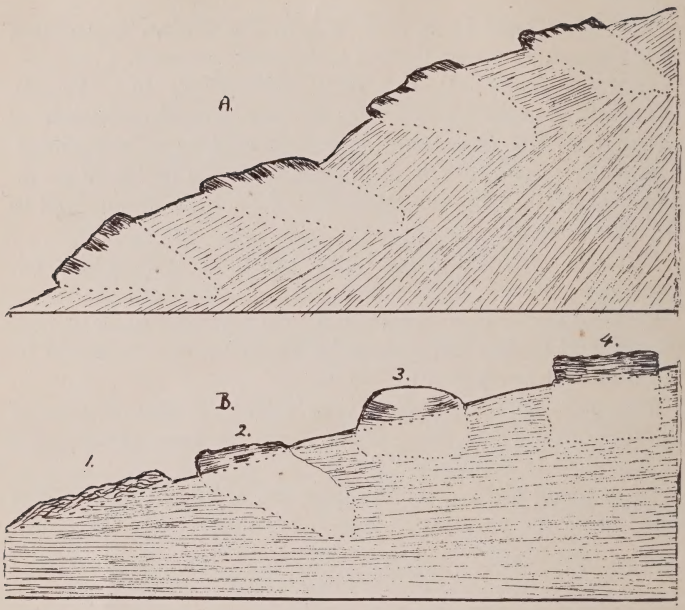


Figure 5—Showing the placing of rocks

A—Each rock fits firmly into the main bed. The stratification runs horizontally and the natural inclination of the rock is on the same plane as the ground in general
B—How four different types of rock might be placed to best advantage when building a small rock garden entirely with one kind of rock

It is decidedly natural, but shows no signs of weathering or stratification.

4. A type of rock often met with. It is not at all a difficult rock to deal with, and is especially helpful where the building is likely to show signs of a flattened appearance. A piece of this nature would help to lift the structure considerably, but where its use is intended in that way, it must not be overdone or the builder will soon see that he has a series of square blocks throughout the construction. Incidentally, such a rock, to be helpful as described, should not be buried so deeply as shown in the diagram, but simply stood on end and exhibiting the best part to a front view. Where construction is entirely dependent upon this type of rock, it should be used in various ways, in

A ROCK GARDEN WITH WINDING PATHWAY

The situation for a rock garden of this design may be either modeled out of low-lying ground by excavating to give the serpentine path effect and using the soil to build the banks on each side of the pathway, or constructed from ground level by incorporating other soil to give the formation. The plant in the foreground is Tiarella cordifolia, the native Foamflower, which produces loose panicles of many small, milk-white flowers in May

most cases the greater part buried. This is an asset rather than a loss, for the portion buried would help to conserve the moisture.

As each rock is placed, viewed and considered correct, the soil should then be pounded hard to and underneath the rock, making sure there are no air spaces. If the rock is of a size that can be conveniently handled, it would be as well to lift the rock out and see if there are any spaces where the rock has not been fitting tightly to the main bed. To make sure the rock is firm and solid, a good test is for the builder to stand on the rock and try to move it. Rocks placed with a view to the method described, and so, carried out in that way, will retain the soil, thus avoiding falling rocks and air spaces.

Mention has been made of the making of crevices for the reception of those plants that like to feel themselves shut tightly between two rocks. Such plants as have a craving for this existence, and common to most rock garden enthusiasts, are the Saxifrages (Encrusted) and the Leontopodium (Edelweiss) that seem to thrive so well under these conditions.

All that is necessary to make a horizontal crevice is to choose two pieces of rock with fairly even surfaces, and nearly the same size for preference. One piece should be placed in position, taking care that the whole of the rock is slightly tilted up at the front so as to be inclined into the main bed; then a layer of good soil for the depth of about three inches should be placed on the top, and proceed with planting. Now place the other rock on top, making sure the rock above does not overlap the under one. (See Figure 6.)

As the building proceeds, so pockets will be made and so, of necessity, will be the distance between the rocks. The pockets for the most part will be on the same slope as the general plane of the ground—on a gradual incline to the center. Yet in cases where one would desire to create a variation from the remainder of the pockets, some could be made flat, so as to be formed from a rock at the front to a near one behind. The pockets on the gradual slope have much to commend their value; the inhabitants can be viewed better and certainly look more

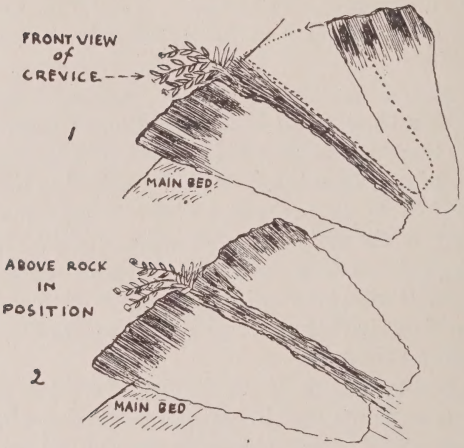


Figure 6—Method of making a crevice

1—The dotted line is to represent the above rock in situation fitting tightly on the layer of earth

2—As the crevice should look when completed. The rain would follow the course of the rock, and so be carried along the passage of the plants' roots

natural. Further, the water has a better chance to get away, whereas in the case of the pockets on the flat, it is possible that the water may be held at the base of the plant.

As the rocks are placed, avoid straight lines; and, furthermore, avoid placing the rocks so as to form a series of squares from bottom to top, which is generally the outcome of striving to make pockets with the idea that one should be something apart from its neighbor. They should not be shut in on all sides, and in cases where the rocks are large, the plants are excluded from a free circulation of air and therefore the purpose is defeated, while the plants themselves cannot be viewed to advantage.

Place the rocks as naturally as possible, taking into consideration the strata of the rock, which should run horizontally, and the natural bend or inclination, and, finally, as the rock is placed, that it should fit firmly into the main bed. (See Figure 7.)

Figure 7—The beginner's rock garden completed, showing the best situations for the various plants. The formation chosen was so that the ground should gradually rise and fall. From Hypericum reptans to Cerastium tomentosum there is a depression in the ground giving the desired effect

The foregoing diagram is the beginner's rock garden completed, showing the places where the different subjects would be best suited, and combining as many varieties as such a comparatively small area will allow.

Selecting Suitable Plants

The plants, which may be purchased at most nurseries, are by no means difficult to grow, and in the Spring give a mass of color. They are all perfectly hardy, and once established, will stand the cold and trying Winters without dying.

A problem in planting the small rock garden where one is trying to combine as many different plants as possible, is the variable rate of growth of the plants. For instance, Saxifraga macnabiana, making leafy rosettes and but a few inches high, would not command the same amount of space as Aubrietias and Arabis, which by nature are of a trailing habit.

Daphne cneorum or Garlandflower

One of the most beautiful of low growing evergreens for the rock garden. The flowers, a bright pink, are sweetly fragrant, and during May the air is filled with their delicious fragrance. Plant in sun or partial shade, in a peaty soil mixture

Arabis albida florepleno

A very showy, hardy plant for the rock garden; will thrive in an ordinary soil mixture, in a sunny or partially shaded situation. Flowers in May. The double-flowered variety should be grown in preference to the single, as the pure white flowers of the former retain their beauty so much longer

These trailing plants of vigorous growth are the main feature for masses of color in the Spring, in small and large rock gardens alike. Therefore, at the time of planting, one should bear in mind the nature of the particular plant and what amount of growth it is likely to make during a growing season. The plants that are so rampant, such as Arenaria montana, Aubrietias, Arabis, Cerastiums and Dianthus caesius, should be given a place where they can continue to make their growth over a rock, or be planted at the foot of the rock garden where they can expand over the pathway without deteriment to their neighbors.

Where one is planting a small structure, the rocks would probably be of a proportionate size, and in this case the planting of vigorous growers over a rock would be inadvisable. In such instances the second method should be adopted.

Soil Composition

Before proceeding with the planting, consideration should be given to the plants in relation to their various tastes for soil composition. The top layer of soil in which the rocks were placed is of a neutral composition, and at the time of preparing was described as a good mixture for the general run of rock plants.

Where one is growing plants that are of a lime-loving nature, and a nearby pocket is inhabited by peat-loving plants, care must be taken that the lime does not wash into the pocket containing the peat, as it would probably prove fatal to the inhabitants. Some means should be devised so that this does not happen. There are two methods which might be employed:

1. In the larger rock garden one might consider planting in various sections, so that there would be a section for lime-loving plants, another for peat, and still another for those plants that thrive best in a neutral soil.

The small garden with limited space and where sections for the various compositions of soil are out of the question, is an instance where the second method may be resorted to.

2. The soil should be taken out of the pocket to the extent of the depth of the good earth, and then thoroughly mixed with the necessary ingredients, as the particular plant requires. Now choose some pieces of flat rock, thin, but with large surfaces, and fix tightly around the edge of the excavated pocket so as to form a lining of rock. The holes where the rocks do not meet can be filled in with small stones and moss. The edge of the rock will just be on ground surface, but this can be camouflaged with a neutral soil or a piece of rock here and there. Personally I have adopted the foregoing method on several occasions and find it answers the purpose quite well.

In the diagram of the beginner's rock garden (Figure 7) the majority of the plants will thrive in a neutral soil, but there are exceptions that will welcome the additional ingredient of lime, which can be mixed with the soil in the form of mortar rubble or limestone chippings. These exceptions are planted near each other. They are Leontopodium (Edelweiss), which should be

planted in the crevice; Aster alpinus and its white variety; also Saxifraga macnabiana. All these might be planted together in the way of association. Helianthemum, Anemone pulsatilla, Aubrietia and Arenaria montana are indifferent to soil taste, so that the lime washing into their territory will not harm them.

Planting

With the question of soil best suited for the various subjects disposed of, planting can be proceeded with. Do not overcrowd the plants, but leave sufficient space in which the plants may attain their full development. There is nothing to be

Leontopodium alpinum (Edelweiss)

Few plants are more treasured in the beginner's rock garden than the Edelweiss. Their star-shaped woolly heads (only in part true flowers) are quaint rather than objects of beauty

gained by crowding the plants together, which is generally done with a view to giving a quick effect, as sooner or later thinning out will be necessary.

The matter of planting would lead the beginner to wonder what is the best time of the year for setting out the plants. Any time of the year, provided there is good weather and sufficient time is given the plants to establish themselves before the Winter. Spring is an admirable season and should be given preference over Autumn.

The majority of rock plants are grown in pots and can be purchased from the nurseryman in that way. Set out in the Summer time, they will do quite well, provided they are given the necessary watering at times.

In planting, a hole should be made large enough and the bottom broken up, taking care the earth that made the formation is not brought to the surface. The plants should be knocked out of the pots and the roots carefully loosened. Avoid breaking off any of the long roots with their fibrous ends which are the means of the plant's subsistence. The bulk of the soil in which the plant was potted will probably be hard; this should also be loosened, so that the roots will have no opposition in penetrating the new earth when planted.

As the plant is inserted in the hole place the good earth around it, tightening from the bottom; then fill and tighten again, and so on until the surface is reached. Don't be tempted to simply make a hole, put the plant in, fill up with earth, and then tighten. In such a case, the soil would be firm at the top, and loose at the bottom. Rock plants are no exceptions to the rule of planting and must be made firm.

When all the plants are set out in their allotted spaces, watering is the next important part of the work. The plants should be given a thorough watering. This will also be helpful in giving the plants a further tightening, by washing the finer particles of earth around the plant's roots. Within a reasonable time the plants will appreciate the care extended to them by establishing themselves and covering the greater part of the rocks in a growing season.

Aster alpinus albus

There are several varieties of the Alpine Asters, varying in color from pure white to rose pink and to violet blue. They may be planted in association in one pocket, all requiring a sunny situation and the same soil composition—a good depth of gritty loam. The large and showy flowers are produced singly, on 6- to 9-inch stems, flowering throughout May and June

When the rock garden is planted, and for the most part with subjects in masses that will give the main showing in the Spring, the rock gardener should look for any available space for the planting of two interesting genera, namely, the Sedums and Sempervivums. They are not grown in the small rock garden in masses as flowering plants are.

In the case of the low-growing Sedums, they spread with such surprising rapidity that in time they become a nuisance rather than desirable. Still, a representative collection of the low-growing varieties is interesting not only for their flowers, but for their evergreen foliage. They thrive in the hottest and driest situations, planted in but a very few inches of very sandy soil, and are averse to wet weather in Winter.

When planting the Sedums, the gardener should consider their rate of growth, also that of their intended neighbor, so that one is not likely to grow into the other. The difficulty might be overcome by planting in the crevices of a rock, so the plants may continue their growth over a rock without doing any harm.

In the rock garden (Figure 7) the Sedums could be planted reasonably near to the Helianthemum, Leontopodium and Saxifraga macnabiana, or near and above Hypericum reptans.

Nurserymen usually grow Sedums as ground plants and they are dug from the open ground and sold in good sized clumps. These clumps should be divided into small pieces so as to make several small plantings.

Choose their location for planting, which need not be spacious; then break up the soil and incorporate plenty of sand or grit, which will keep the ground porous.

Set in the plants some little distance from each other; in a reasonable time they will grow into each other and cover the ground to the extent of their territory, until thinning out will become necessary and another planting elsewhere might be considered.

Because of their hardiness and ease of culture, the following varieties are to be recommended to the beginner:

Sedum album. Foliage green; small white flowers.

S. acre. Bright green leaves; yellow flowers.

S. anglicum. Delicate pinkish white flowers.

S. glaucum. Is especially attractive for its glaucous green foliage.

S. lydium. The leaves are borne in tufts, which turn bronze as the cold weather approaches. The flowers are pink.

S. sexangulare. Is much the same as S. acre, with yellow flowers.

S. dasyphyllum. Is not common, but found in nursery catalogs which specialize in rock plants. The leaves are glaucous blue and fit tightly on a three-inch stem. The flowers are pink.

Sempervivums thriving in a dry situation: *Above*—**Sempervivum atropurpureum;** *below,* **Sempervivum arachnoideum**

The Sempervivums are interesting additions to the rock garden, and at seasons when there is little or no flower, the rosettes in their various colors never fail to attract attention. They are cultivated chiefly for their foliage, which is evergreen, rather than for the flowers themselves. An individual flower is larger than that of the Sedum.

These plants are increased by means of miniature rosettes attached to a thin stem sent out from the parent plant. These single rosettes, severed from the parent and inserted in sandy soil, will very soon root and later send out rosettes from bases of their own.

Like the Sedums, they are best planted in a sandy soil in a hot and dry situation, and detest water lodging at the base of the rosettes, which invariably means death through rotting. The

illustration on page 27 will show how well these plants thrive at the base of a rock, obtaining sufficient moisture, but at no time becoming surrounded with water.

They are purchased from the nurserymen in pots. In the case of varieties with large rosettes, one would find a large rosette in the pot, with several smaller ones attached. The plants should be knocked out of their pots and planted, leaving the smaller rosettes attached.

The following list is to be recommended on account of the variety of its different colored leaves, and may be found in most catalogs of hardy plants:

Sempervivum arachnoideum or Spiderweb Houseleek

Probably the best known of the Sempervivums. The silklike hairs (cobwebs), extending from leaf to leaf, are intricately interwoven, suggesting that they are made of thin air rather than of earthly elements, yet this plant and other members of the genus grow in a situation where few other plants can rival them. A free application of mortar rubble shows a distinctive whiteness of the silken web. In June and July the larger rosettes produce flowering stems 4 to 6 inches in height, bearing star-shaped flowers of light pink. Plant in any dry situation, or at intervals in the crevices of a soft rock, and in reasonable time each individual rosette will send forth from its base miniature rosettes that will in time cover the rock as illustrated

Sempervivum arachnoideum. Probably the best known of the genus. The rosettes are small and covered with a cobweb-like down. A free application of mortar rubble mixed with the soil will very much intensify the whiteness of the hairs (cobweb). The flowers are bright red.

S. calcareum. Large rosettes of glaucous-green leaves with brown tips; flowers rose colored.

S. funcki. Small rosettes of bright green leaves; flowers red.

S. glaucum. Large rosettes with pale glaucous green leaves.

S. rubicundum. Large rosettes of dull red leaves, tipped green.

S. tectorum. The common Houseleek. Large, pale green leaves with a distinct red tip; flowers pink.

Construction in a Suburban Garden

The following deals with construction on site in a suburban garden.

One often sees in a suburban garden a high wall or a fence surrounding the property, intended either for seclusion or to mark the limits of the tenant's ground. This structure can only be covered with climbers and, if of a deciduous nature, they leave their portion for covering unsightly for many months of the year. If, however, evergreen climbers are used, they serve a purpose rather than render any particular interest.

Providing there is sufficient light and the property is wide enough to ensure a free circulation of air, one might consider the building of a small rock garden.

Figure 8 shows a ground plan of what might be accomplished in a suburban garden as described.

The actual construction can be carried out by the average enthusiast, while the expenditure would not be beyond his means. The aspect, we will assume, is a southern one and in full view of the sun. The ground is quite level. The partly surrounding wall is about six feet high, and the portion to use is twenty-eight feet each way from the north corner, going east and west. The adjacent ground will probably be under culti-

vation as a lawn, which would give a pleasing approach to the rock garden.

The following deals with the construction on the foregoing site:

The extent of the construction along the pathway should be marked out with a spade, not as a straight line, but to give a winding course. The width of the path might be whatever the builder chooses, so long as it is in proportion with the size of the construction. At the part of the pathway marked "Depression through center" (See Figure 8), it would be advisable to have the path take a distinct curve into the main bed and then swing round the hillock to the right and continue its course to the wall. Eventually, this will give a pleasing effect, with the pathway jutting into the valley and the ground gradually rising on both sides. The visitor approaching the rock garden from one side will come upon the valley with surprise.

The extent of the ground which will be occupied by the flowering shrubs and evergreens should be marked out to a point where the ground will rise, forming the rock garden, and be given a thorough trenching.

From the wall to the extent of the planting will be approximately eight feet, but trenching should be done beyond this point to where the actual work will commence. The foreground of Rhododendron obtusum kaempferi, Pieris floribunda and Kalmia latifolia should be included in the trenching, and will be given further consideration later with reference to its planting.

If it is desired, the ground might be raised at the back by bringing in other earth and grading down from the wall to the extent of the shrubs.

Should the ground be poor, incorporate well decayed manure as the trenching proceeds and work into the soil much below the surface—about one spade's depth.

If, perchance, the ground is inclined to be heavy and of a sticky nature, then a deeper trenching and an application of coarse sand would help to break up the plasticity. On no account should lime be used, for the reason that several of the shrubs intended for planting are ericaceous and abhor lime.

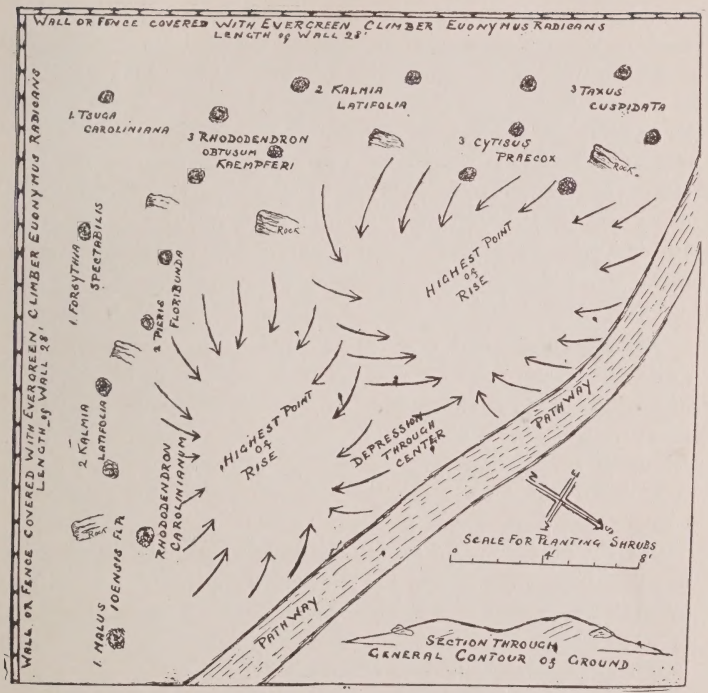


Figure 8—Ground plan to show aspect and situation of shrubs. The arrows represent the gradual rise of the ground

Where one is unable to purchase farm manure, he may resort to bonemeal, which should be applied by occasional dustings as the soil is turned over. When trenching is carried out during the Fall, the coarser grade of bone should be used, but in the Spring months the use of fine bonemeal is advisable as the former is slow in its action.

Planting of Euonymus

Close up to the wall Euonymus radicans may be planted. This climber has the advantage of being a quick grower and would cover the wall in less time than it would take the shrubs

to hide its presence. On the other hand, Euonymus radicans has this disadvantage, that through its enormous root system it will send out its roots to an incredible distance when planted in good soil. However, this can be overcome. After the plants have established themselves, upon lightly forking through the shrubs during the growing season by way of keeping the ground clean, these roots will probably be in evidence. One should then drive a spade straight down into the earth, about a distance of two feet from the base of the plant, and fork out the intruding roots.

Purchase of Shrubs

The evergreens and flowering shrubs (See Figure 8) are quite hardy and can be purchased in various heights. The distance between the individual plants and groupings will have every bearing upon the size of the plants. It is not always advisable to purchase large specimens. If they have any considerable distance to travel, the soil surrounding the roots will become detached.

Buy the plants from a local nurseryman, not only because of less distance to travel, but for the reason that they have withstood the same Winter conditions as exist in the locality intended for them.

When they are bought as small plants, the probabilities are they will establish themselves in less time than would large specimens, and the beginner is taking less chance of disappointment. A good size of evergreens to purchase, and reasonably priced is about two feet six inches for upright growing varieties, such as Taxus cuspidata; and eighteen inches in diameter for prostrate evergreens, such as Juniperus horizontalis.

In purchasing Tsuga caroliniana, one should choose a fairly large specimen, about five feet high. It occupies a central position, and among the shrubs it will be the first to be noticed.

As a general rule, evergreens are purchased from the nurseryman with a good sized ball of earth made secure with burlap, but in the case of deciduous shrubs there is generally no earth attached to the roots, and if they are dry when received, they should be submerged in a pail of water before planting.

A sloping bank, facing West, that has been made attractive by means of shallow terraces faced with rocks, to prevent washing. Planted with Primula japonica. The small mound at the base is planted to double English Primroses, Phlox divaricata, Aubretias, Saxifrages, etc.

Before commencing to plant, consideration should be given to the nature of the plants and the distance required between them. For instance, Cytisus praecox with its thin, wiry stems growing straight up would not require the same amount of space as Rhododendron carolinianum with its straggly stems projecting horizontally from the main stock.

Where the plants are to be set in, their places should be marked with a stick representing the center of the hole. When all the sticks are set out, visualize the completed planting, taking into consideration the growth the individual subjects will make in a growing season.

Soil Composition for Shrubs

Then thought should be given to the individual tastes for soil mixture. The subjects indicated on Figure 8 are as follows:

For planting in a neutral soil enriched with manure are Taxus cuspidata, Tsuga caroliniana, Forsythia intermedia spectabilis, Cytisus praecox, and Malus ioensis plena.

The remaining subjects are ericaceous plants. They will tolerate a neutral soil but thrive in one of a leafy and acid composition. These consist of Kalmia latifolia, Rhododendron obtusum kaempferi, Pieris floribunda and Rhododendron carolinianum.

Planting

Those subjects for planting in the neutral soil might be set in first. All that is necessary is to make a hole larger than the ball of the plant and break up the bottom of the hole. The manure which is brought to the surface should be worked into the earth at the bottom of the excavation. Place the plant in the hole and work the earth around the base of the plant sufficiently to hold it there. Next, view the plant from some little distance and see if it is perpendicular. Then fill the hole partly with soil, just enough at the bottom to make it easy to tighten; fill in again and tighten until the surface is reached.

The procedure for planting the other class of shrubs which we termed ericaceous is exactly the same as the last described,

yet they require a different soil composition. A hole should be dug for the reception of the plant and made larger in width than the size of the ball, so that the soil may be tightened from the furthermost part of the ball and overcome the possibility of an air space being secreted. (See Figure 9.)

Figure 9—Showing excavation, larger than ball of plant, with earth partly filled in and tightened

To the soil which has been excavated should be added the same quantity in bulk of well decayed leafmold chopped fine with a spade and run through a half-inch sieve. The soil and leafmold should be thoroughly mixed together. If the soil is inclined to be heavy and sticky, an application of coarse sand will help to render the composition more friable. The use of coarse sand must not be overdone, or the composition will prove too porous and dry out quickly. One would be safe in using sand in a proportion of one-quarter the amount in bulk of the soil and leafmold mixture.

In case one is planting during a dry season and no immediate signs of rain are in view, then each individual shrub must be given a thorough soaking, so that the water will permeate the ball of the plant and come into direct contact with the roots and the nearby ground.

When all is planted and given a thorough soaking, the background can be considered finished for the time being, but will be referred to later for the planting of smaller subjects and extra care extended to the ericaceous shrubs.

Plan of Prospective Rock Garden

With the background planted, we now proceed with the construction of the rock garden. Before carrying out the actual building, consideration should be given to a few important items, and adherence to them will, upon completion of the building, save many regrets and possibly pulling to pieces parts of the rock work.

First, what kind of structure are we intending to build? With the idea in mind or, better still, a rough sketch, one should foresee and consider whether or not the ground is spacious enough to carry out the plan effectively.

Secondly, height in proportion to width is of utmost importance, and should be evenly balanced as viewed from all angles.

The small rock garden we have in view for construction (See Figure 8) occupies a frontage of approximately twenty-eight feet, and extends back about twelve feet toward the shrubs.

The ground is too limited to think of elaborate scenic effect, but large enough to build a simple rock garden that will be sufficiently pleasing to create interest. Even on such a small area of ground it is surprising how many different genera of rock plants may be grown. Every niche and crevice can be planted so that no space be wasted.

We will have our prospective rock garden representing two small hillocks, the depression between them giving a valleylike effect. The elevation to the right will be somewhat higher than its neighbor. Although the two structures are separated to some degree by the inclusion of the depression, they must be so shaped in their formation that each appears related to the other.

The hillock to the left should give the impression that at one time it had been part of the other, but possibly, through time

Path through the rock garden

and constant use of the path (depression), it has become so shaped as to resemble another hillock, and during the construction a connection must be shown—that one is part of the other.

With an idea of what our rock is to represent on completion, we can now proceed with the building.

Construction

The first item is the marking out of the drainage bed upon which the rock garden will be subsequently built. The extent of the ground to be occupied should be marked out as an irregular line, not for each hillock as a separate structure, but the ground space the two will require. For the time being we might conveniently forget the representation of the building.

The working procedure is similar to that for the beginner's rock garden, and to insure definite clearness it would probably be well to fully describe and illustrate working methods throughout the construction.

The length of the drainage bed should not exceed twenty-five feet of frontage and twelve feet at the back, with a breadth varying for necessity of an irregular outline but not to exceed twelve feet. This outline will not only be clear of the shrubs and allow room for their expansion, but will leave ground space for the planting of other subjects and for the placing of rocks here and there to give a pleasing appearance of a continuity of rock from the foot of the shrubs to the commencement of the actual structure.

The front line will be the course the pathway is to take, and the idea of its serpentine trail, swinging round the hillock to the right, would be a desirable plan to work upon.

Then the soil should be excavated from within the line which has marked out the drainage bed. The excavation ought to be at least eighteen inches, but where it is known that water accumulates in wet season, it is advisable for the excavation to be deeper. As the soil is dug out, its value for the making of the formation should be ascertained. Provided it is not too heavy and sticky it might be used again. It need not possess the qualities of good growing soil, as long as it will hold sufficient moisture.

If inclined to be heavy and during wet weather is likely to hold too much water, mix plenty of sand or gravel with it.

The excavation should now be filled in with any material that will render drainage (clinkers, brick ends, etc.) to a depth of about nine inches from the bottom. This part of the construction is called the drainage bed, and it is of utmost importance. Adherence to its value and work thoughtlessly carried out is the difference between success and failure in the growing of rock plants.

On the drainage bed a layer of turf or leafmold to a depth of six inches would be helpful in preventing the finer particles from washing into the drainage material. The soil which has been excavated and given any necessary attention should now be spread over the turf in such a manner as to give the desired formation. Around the edge of the drainage bed, and for some little distance in toward the main part, the excavation should not be filled in to ground level, for reason that there is still more earth to be placed over this formation, in which the plants are to be inserted.

The hillock to the right, being higher than the other, will require a greater amount of soil to be placed on that portion of the drainage bed. The highest part should not exceed three feet from the ground level, then gradually sloping down into the depression and shaping the hillock to the left, whose highest point should not be more than two feet six inches from the ground level.

The use of the words "highest point" must not be interpreted to mean a "point" in its usual sense; this relates to the highest part of the formation.

The depression should not be at ground level, but rise for about one foot with the gradual rise of both hillocks, and then take a level course to the background.

The foregoing operations have given the formation and outline of structure. Now the constructor should see that the shape is in keeping with his plan; at no part should it ascend too quickly, otherwise the outcome will be a rounded effect rather than a gradual rise. By all means have a slight depres-

sion here and there and a general irregularity of contour, but avoid any formal and unnatural formation such as the mound whose shape is self-explanatory.

Planting Compost

With this part of the work completed, consideration should be given to a special mixture which will cover all the formation to a depth of about one foot. The plants are to be inserted into into this mixture, the proportions of which are: one-half loam, one-quarter leafmold, and one-quarter coarse sand. These ingredients should be mixed together, then proceed with placing the mixture over the formation to a depth of not less than one foot, taking care that as the soil is placed the outline is exactly the same as the formation it is covering. (See Figure 10.)

Placing of Rocks

Now the rocks can be placed into position. In Figure 8 it will be noticed there are several rocks placed between the shrubs. These might be conveniently set in position first. Choose fairly large pieces of rock and simply place here and there, where they will be noticed from the front pathway. The best part should be displayed to the front. It is not necessary to bury them deeply unless they are very large. In the case of a small rock, it could be placed on the ground level and soil thrown around its base so that the most is made of its size. These rocks not only give a continuity of rock from the shrubs to the main structure, but furnish added attractiveness to the general arrangement.

When the formation has consolidated, the placing of the rocks on the hillocks may be carried out. Each hillock could be built separately, or the two gradually built up from the ground level by completing a piece here and there until the whole is finished. In any case, avoid walking on the soil more than is necessary. Place the rocks from the bottom and work upwards. This is helpful in utilizing the rocks as stepping-stones, thus enabling the constructor to get about without unnecessarily treading upon the soil.

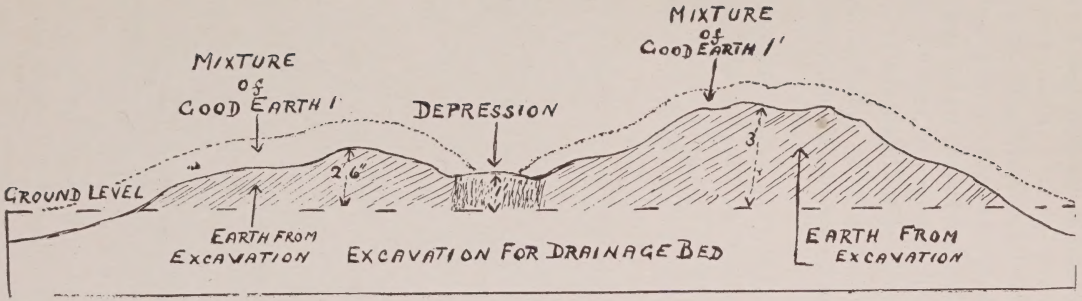


Figure 10—Section through rock garden showing irregular line of formation

Before a rock is placed in situation, look for any special characteristics it may have—probably nicely weather-worn on one side, stratification, or its natural bend. These features should be made the most of and brought into full view. In the case of natural bend or direction toward which the rock is inclined, it should be placed in position with the surrounding soil on the same plane as the rock. (See Figure 5-A.)

Stratification through a rock should always be displayed horizontally, and on no account should the stratified lines appear vertically.

In setting in the rock, a hole should be made large enough for its reception, taking care that the soil which made the formation is not brought to the surface and mixed with the good soil which is on top. Where a large excavation is to be made, necessitating the removal of this formation soil to some depth—try to keep it separate from the good mixture. This is not a difficult task; simply remove the good soil and place it to one side. If further excavation is necessary, place the formation soil in a receptacle. As the rock is placed in the hole, viewed and found correct, the soil from the receptacle should be placed around the rock, making allowance for the depth of good soil to go on top.

As the soil fills the excavation around the rock, it should be made solid so the rock will fit tightly into the main bed. The rocks used through the depression should have a flattened surface and be placed in the form of stepping-stones. Set them here and there, some little distance from each other and avoid regularity. For the most part they will take the same course as the formation. Simply drop the rocks at irregular intervals and make firm. Later on plants will be inserted in the crevices between the rocks.

When all the rocks are placed in position, construction is completed. Several days must elapse before proceeding with the planting, so that the soil and rocks may have an opportunity to settle.

Purchase of Plants

All having consolidated, the next consideration is the purchase of suitable planting material. The aspect is a sunny one, therefore, this fact must be borne in mind when procuring the plants.

As the culture of rock plants, other than ordinary kinds, is something new to American nurserymen, one must often perforce use the same members of genera in several different places, in order to cover the planting space. There are, however, a few nurserymen who specialize in the true Alpine plants, natives of the high European and other mountains. These nurserymen are few and far between. Their plants are usually raised from seed, which means that much time is required to produce a

Aubrietia olympica

The Aubrietias in their various colors, ranging from mauve to deep blue, and light pink to dull red, are very showy in the rock and wall garden during May. A. olympica is blue. All are of trailing habit and should be planted in a well drained soil, in a situation where they can expend their energy

salable plant, usually bringing the cost beyond the means of the average beginner in rock gardening.

Fortunately, there is available sufficient desirable material to warrant the beginner planning a successful rock garden at moderate expense. As interest develops, plants of a more Alpine nature may be produced from seed.

Planting

The number of plants to set in each pocket will be dependent upon the amount of ground space, and not a little upon the nature of the plant.

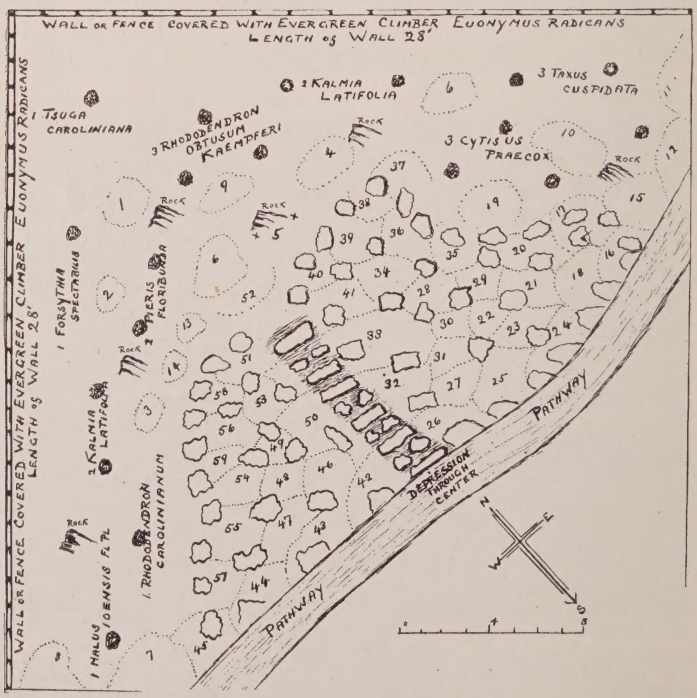
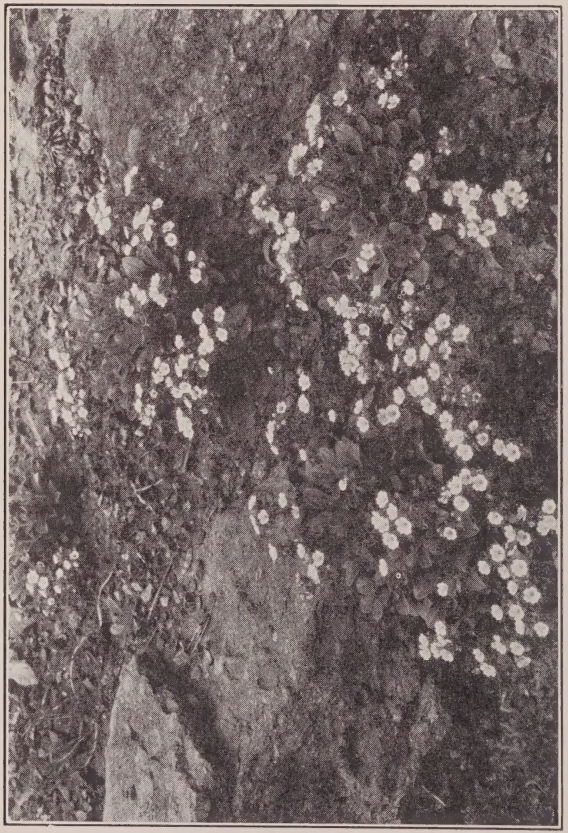


Figure 11—Ground plan showing situations of shrubs, rock plants and depression (path)

Figure 11 shows the situations for plants enumerated below that may be used on the site under consideration. They have been chosen for their hardiness, are easily procured, and are not expensive.

1 Mertensia virginica
2 Erythroniums in var.
3 Dodecatheon meadia
4 Heaths (Ericas) in var.
5 Daphne mezereum
6 Phlox divaricata var. laphami
7 Polyanthus
8 Daphne cneorum
9 Galax aphylla
10 Phlox procumbens coerulea
11 Primula denticulata
12 Primula denticulata alba
13 Iris cristata
14 Nierembergia rivularis
15 Iris pumila
16 Phlox subulata, G. F. Wilson
17 Campanula carpatica turbinata
18 Arabis albida
19 Aquilegia caerulea
20 Saxifraga macnabiana
21 Androsace chumbyi
22 Dianthus neglectus
23 Dianthus caesius
24 Phlox subulata nelsoni
25 Alyssum saxatile
26 Armeria maritima
27 Anemone pulsatilla
28 Saxifraga macnabiana
29 Aster alpinus
30 Aster alpinus albus
31 Androsace sarmentosa
32 Phlox subulata lilacina
33 Phlox subulata, G. F. Wilson
34 Dianthus caesius
35 Campanula carpatica var.
36 Gypsophila repens
37 Myosotis alpestris
38 Oenothera glauca fraseri
39 Cerastium biebersteini
40 Lychnis lagascae
41 Iberis sempervirens
42 Saponaria ocymoides
43 Aubrietia (blue)
44 Iberis sempervirens
45 Phlox amoena
46 Gypsophila cerastioides
47 Viola Jersey Gem
48 Dianthus deltoides
49 Leontopodium alpinum
50 Arenaria montana
51 Arabis aubrietioides
52 Ceratostigma plumbaginoides
53 Hypericum repens
54 Campanula carpatica var. alba
55 Dianthus caesius
56 Helianthemums in vars.
57 Aster Mauve Cushion
58 Dianthus caesius
59 Adonis amurensis

The crevices between the flat-surfaced rocks, making a pathway dividing the two hillocks and previously described as "depression," should be planted with low-growing subjects



Gypsophila cerastioides

An easily grown and beautiful subject for the rock garden. Quite different from other members of the genus, inasmuch as the plant is compact, with flowering parts creeping, and the hairy, deep green leaves nearly as broad as long. The flowers are white, veined pink, and are produced in June. Plant in a sunny aspect in a gritty loam

adapted to such purpose. They will grow over the rocks in reasonable time, forming a dense mat of foliage or growing along the crevice, nestling closely to the soil for the length of rock extended to them.

There are many genera suited for crevice planting, and when the beauty of their flower is over, their evergreen foliage is attractive at a time when little or no flowers are visible elsewhere in the rock garden.

The Thymes are especially pleasing. The foliage of the different kinds varies from gray to leaves margined with yellow, and others of a deep green; and their thin, wiry stems do not object to being trodden on, which is so likely to happen to plants inserted along the edge of rocks forming a miniature pathway.

The following plants may be utilized by the beginner for planting in crevices of this nature:

Acaena buchanani, 2 inches, gray foliage.
Antennaria tomentosa, 4 inches, silvery foliage.
Aubrietia deltoidea graeca, 3 inches, purple flowers.
Campanula pusilla, 3 inches, blue flowers.
Campanula pusilla alba, 3 inches, white flowers.
Hypericum repens, 3 inches, yellow flowers.
Hypericum reptans, 3 inches, yellow flowers.
Sempervivums (any of those described on page 29).
Sedums (any of those described on page 26).
Thymus citriodorus argentea, 6 inches, leaf margin silvery.
Thymus citriodorus aureus, 6 inches, leaf margin golden.
Thymus serpyllum lanuginosus, 4 inches, silky leafed.
Thymus serpyllum album, 2 inches, gray leafed.
Thymus serpyllum coccineus, 2 inches, green leafed.
Veronica repens, 1 inch, green leafed.

When the rock garden is planted it should be given a thorough soaking, and as the water penetrates into the earth so that the ground may be worked, then a light pricking up of the soil will assist in the establishment of the plants.

The planting of smaller subjects in the background and extra care extended to the ericaceous shrubs, heretofore briefly referred to, should now receive attention. There are many plants

that might be grown between the groupings of shrubs, either for ground cover or clumps here and there of flowering or bulbous plants. Pachysandra and Vinca are the two favorites for ground cover. Their use is often overdone, however, and a colony of low-growing flowering plants will give much more interest. Suitable flowering plants for this purpose are indicated on Figure 11.

The extra care by which the ericaceous subjects will benefit consists of a good mulching of leaves, six inches deep, for a distance as far as the roots are likely to extend. For the sake of appearance use decayed leaves. As these shrubs make fibrous hairlike roots within a few inches of the ground surface, do not be tempted to dig or fork in the vicinity of their roots as the result would be injurious to the plants' welfare.

Situation on a Bank

The preceding sites, with methods of construction have been from ground level; this in view of the fact that the majority of rock gardens, probably built by the enthusiast himself, will usually be constructed from ground level.

Banks and prominences are not common in the average garden, but where present they have been, in many cases the inspiring guide for one to plan a rock garden. What may be accomplished will be dependent upon the actual situation, the ground available, the grade and the aspect.

In the case of a high bank winding paths could be formed from the foot of the bank to its summit. Then again, water, if near at hand, might be introduced by falling from shelving rocks into pools which, on overflowing, could run in streamlets, along the sides of which may be grown many moisture-loving plants.

In another instance, where one is in possession of a bank yet the grade is too steep for the project owing to the amount of labor required to excavate and fashion it into a rock garden, the building of a wall garden could be contemplated the construction of which will be given consideration later.

Methods of modeling a bank into a rock garden will differ according to the layout of the ground itself and the desires

of the builder. But there are general rules governing the success of the culture of rock garden inhabitants.

There must be proper drainage and an assured depth of good soil. The ordinary plants used to furnish a rock garden, such as ground Phlox (Phlox subulata) Cerastiums and Violas, will thrive in any ordinary garden soil, but in time the enthusiast will want to grow some of the better rock plants, as the smaller Campanulas and Saxifrages, which would barely hold their own in any soil but one specially prepared for them.

If from the outset the beginner is impressed with the importance of drainage and a depth of good soil, he will have the fundamentals to insure success with most of the better varieties of rock plants.

The two rock gardens previously described will grow most rock plants in so far as attention has been given to drainage and soil mixture. No matter what the builder's taste may be in regard to the design, whether on slope, bank or level ground, after he has sketched or visualized what his completed construction should look like, the first important part of the work is to see to the drainage.

It would be difficult, if not impossible, to conclude that one design would be suited to all banks and prominences. Therefore, the builder must choose a plan suited to the particular situation. Whatever his decision, certain important details of the work should be borne in mind. These facts we will consider in the building of a rock garden on a disused undulating bank in one of the farthermost parts of the garden.

The ground, we will assume, is for the greater part exposed to the full day's sun, the background partially surrounded with wild herbage—saplings and undergrowth—and the bank itself perhaps growing grass and noxious weeds.

We will not consider any special design or representation in nature, but will give every thought to the building in so far as the culture of the rock plants is concerned; and later, if the enthusiast is so inclined, some of the more difficult or rather out of the ordinary rock plants might be tried, as he will have a suitable rock bank already prepared for their reception.

Sanguinaria canadensis or Bloodroot

Frequently met with in wooded areas of eastern North America, but not essentially a shade lover. Will thrive and increase in a sunny situation if planted in a moist, leafy soil composition, as found in its native haunts. The flowers, a pure white, are solitary and appear in April

Preparation of Bank

The grass in the form of sods should be skimmed off the bank and placed at one side. Probably this turf would be helpful in making up the general mixture, but if there is reason to believe that it is full of weed seed or thick tap roots of weeds, it may as well be thrown away. If a general mixture of soil is prepared containing such obnoxious properties, one will constantly be pulling out weeds later on.

Now the ground should be broken up with a pick for a considerable depth, at least two feet; even deeper would be of great advantage and assist in drainage. Roots of trees and all weeds should be thrown out, or the chances are, if left in, they will constantly show signs of their presence by coming up here and there.

The ground might even be trenched to a depth of two feet, and about two feet six inches in width, commencing the operation at the top of the bank and working down hill.

The first excavation should be placed at the base of the bank; therefore, as the trenching proceeds, the earth at the base of the bank will fill in the last trench.

On such a situation the chances are that water will not accumulate to such an extent as it would on level ground; yet, at this part of the operation, we must take no risks of having a water-logged soil.

As the soil is tilled its properties should be ascertained. Is it liable to hold too much water in wet season? Is there any likelihood of its drying out too quickly after rains? Exactly what is desired in a soil that will hold sufficient moisture and in wet season allow any surplus amount to pass through to the drainage.

If the soil is very light and sandy, a free application of well decayed manure or rich vegetable garden soil will be helpful to bind the finer particles and conserve the moisture. If the soil is heavy, so as to be tenacious and sticky in wet weather, and holds too much water, then mix lime with it, which will help to break up the plasticity, and add chippings which will aid in keeping it open.

Where one has a quantity of small stones, chippings, clinkers and cinders (the big pieces only), they should by all means be worked into the soil as the trenching proceeds.

This procedure gives us perfect drainage on the bank, and now we give consideration to a good general mixture of soil heretofore prescribed. (See page 11, paragraph 2; also page 40, paragraph 2.)

The general mixture should be spread over the bank to a minimum depth of at least one foot. Spread in such way that it is in accordance with the contour desired; therefore in keeping with our plan.

Now we consider the placing of the rocks.

Placing of Rocks

In cases where the rocks are large and it is necessary that we bury the greater portion of them, the builder may consider placing the larger rocks before the general mixture is spread over the bank. The reason for this procedure is that when the good general mixture of soil is distributed over the bank, should excavation then be made, the chances are that the earth and drainage would be brought to the surface and possibly become mixed with the good soil.

The actual placing of the rocks has already been mentioned (See Figure 5), but repetition of one or more facts may be helpful to the beginner.

1. Don't overdo the use of rock.

2. Bury each rock deeply, the broadest face exposed.

3. Each rock should be tilted inwards and downwards, fitting firmly into the main bed.

The rocks throughout the structure should show a relationship evidencing that one rock belongs to another, having a sunken appearance as though they had lain there for generations—suggested by their faces protruding from the earth.

As the beginner realizes success with the building of his own rock garden, he will become so enthusiastic that, while the

Lewisia cotyledon

All members of the genus Lewisia are indigenous to this continent. The thick, succulent, shiny, dark green leaves of L. cotyledon are formed in a rosette radiating from the apex of a thick, fleshy taproot. The flowers, borne in early Summer, are pale pink with faint lines of deeper pink through each petal. Plant in a well-drained, sunny pocket in a good, rich, sandy loam. The Lewisias detest excessive moisture and after flowering should be given protection from heavy or prolonged rains by covering with a pane of glass. They are well worth a situation in the rock garden and may be purchased from collectors of native flora

ordinary plants give him an amount of pleasure, others will be sought of a more dignified character.

Following is a list of plants not difficult to grow and with brief descriptions, which can be recommended to a beginner who desires to have subjects for his garden rarer than the usual run of rock plants seen from day to day, such as Alyssum, Aubretia, and the coarser growing Dianthi. The rarer ones are not advertised in all hardy plant catalogs but can be purchased from nurserymen who specialize in rock plants.

A Selection of Less Common Rock Plants

Achillea clavennae. Compact tufts of silvery foliage and white flowers; blooms during Summer months.

Aethionema amoenum. Bluish gray foliage and large heads of bright pink flowers. May.

A. Warley Hybrid. One of the best of the genus; brilliant rose colored flowers and glaucous blue foliage. May.

A. pulchellum. Another desirable Lebanon Candytuft with glaucous leaves and bright, rose pink flowers. May.

(The Aethionemas are almost shrubby in habit, and if cut back after flowering, they will make stronger plants for the next year. Plant in a sunny position, in sandy loam).

Androsace chumbyi. Silky leaves formed in rosettes which are always attractive; flowers are bright pink. May.

A. sarmentosa. One of the easiest of the Androsace. Like the foregoing, it has silky leaves forming rosettes; flowers pink. May.

A. lanuginosa. Trailing growth and soft, silvery foliage. The rosettes are much smaller than the two previously mentioned; flowers lilac rose. June.

(The Androsaces are not difficult to grow, although so reputed. They should be planted in very gritty soil. A free application of mortar rubble intensifies the whiteness of their silvery leaves. Their worst enemy is a water-logging soil).

Anemone pulsatilla. Flowers of a pleasing violet blue with bright golden stamens. May.

Anemone pulsatilla—Flowers, leaves and seed head

Flowers a lovely violet blue, each center containing a cluster of golden anthers. The young leaves are thickly covered with silken hairs. This early flowering Anemone should be included in every rock garden. Plant in a sunny situation, in well drained soil with an application of chalk

A. pulsatilla rubra. A varietal form of the above; flowers deep violet red. May.

(Plant in a deep, well-drained, loamy soil, in full sun).

Armeria caespitosa. Forms compact rosettes, tightly bunched together; different from other members of the genus in that re-

spect. Flowers are pale pink, carried on short stems. Early Summer.

A. cephalotes. Foliage is long and narrow; flowers pink, on rather long stems. Is attractive. Early Summer.

(Plant in sandy loam, in sunny position).

Bellis caerulescens. A very dainty little plant. The flowers, carried on thin 3 inch stems, are pale lilac, flowering for the most part of Spring and Summer.

(Plant in a sunny position in a well-drained soil).

Campanula abietina. Dwarfed, tufted growth; flowers purple, on long stems. June.

C. elatinoides. Of spreading habit; pale blue flowers; leaves covered with soft, downlike hairs. June.

C. garganica. A gem for the rock garden. Forms low-spreading tufts which in June are covered with starry, light blue flowers having a white eye. July.

C. lauri. Flowers of a lavender shade, which instead of drooping, as is usual in the genus, turn up. Summer.

C. muralis. A dwarf plant covered with blue purple flowers; Summer. Also known as portenschlagiana.

C. pulla. A real gem for the rock garden. The flowers, a deep purple blue and unusually large for the size of the plant, are carried on thin, wiry stems, 3 inches high. July.

C. pusilla. Another dainty plant which should be grown in all rock gardens; it is a strong grower and multiplies rapidly. The flowers are pale blue, 3 inches high. July.

C. pusilla alba. A white form of the above.

(The dwarf Campanulas are very beautiful and come into flower when the early rock plants have finished blooming. Plant in a well-drained, rich, sandy loam, in a sunny position. Campanula pusilla and the white variety should be planted in a pocket where they can spread and form a dense mass).

Dianthus alpinus. One of the most beautiful of the Dianthus. The large, rose-colored flowers are carried on short, stout stems; the narrow, pointed leaves are dark green with a shiny surface. Plant in deep loam with lime added, in a position where the

plants will receive a little shade during the hottest part of the Summer. Place small pieces of rock under the foliage so that the leaves may not lie directly upon the ground. 4 inches high. June.

D. brevicaulis. A much dwarfed plant, forming a tight tuft of small leaves; the flowers, of rose mauve, are solitary and fit close to the plant (sessile). May.

D. neglectus. Is a very beautiful plant; should be included in all rock gardens. The flowers are rose colored, on a 5-inch stem; the plant is compact, with leaves narrow and pointed. Plant in a sunny position. June.

D. subacaulis. Much dwarfed plant, forming a tuft, with rose-colored flowers on a very short stem. Plant in well-drained soil, with sunny position. June.

Draba aizoides. Is a worthwhile plant, forming miniature rosettes of spiny leaves with hairs along their edges. The flowers are bright yellow, on 3-inch stems. Plant in gritty soil, in a crevice, with a sunny position. May.

D. dedeana. Forms dense tufts, with small white flowers, in early Spring. Plant in gritty soil.

Dryas octopetala. Sub-shrubby and forms a flat carpet of dark green foliage and Anemone-like, white flowers with numerous yellow anthers. June.

Gentiana acaulis. An exceedingly beautiful Gentian and often spoken of as a difficult plant. The flowers are large and funnel-shaped, color deep blue, carried on short, stout stems. The leaves form a dense mat of green. Plant in a depth of good, mellow loam, in a sunny position. It is not difficult to grow, and once established, it will continue to flower, but dislikes being moved. The beauty of the flower compensates for the extra care expended. Spring.

Primula auricula alpina. The growth is attractive, forming rosettes of thick, fleshy leaves. The flowers, which vary in color, are borne in clusters on stout, 6 inch stems. Plant in partial shade, where they will receive moisture at their roots. Overcome any possibility of water lodging around the base of the leaves, which invariably causes them to rot. Spring.

Primula denticulata

The earliest to flower of the Primulas. It is perfectly hardy, but in view of its early flowering, should be planted in a sheltered situation, in rich sandy loam, on slightly elevated ground where water cannot accumulate around its base. The flowers are pale lilac, carried on 6- to 9-inch stems

P. denticulata cashmiriana. Is a good form of the type (P. denticulata), having lilac pink flowers of deeper coloring. Plant in partial shade, in leafy loam. Flowering in very early Spring.

Do not be contented to merely purchase a plant, as a Campanula, with blue or white flowers, or a Dianthus with pink flowers. Both are large genera with members diverse in stature, leaf and flower. See that the plants you intend purchasing, when answering advertisement, have a second name (specific), viz., Campanula *pusilla*, which corresponds with your requirements.

Running Water Included in a Rock Garden

Within a rock garden, irrespective of design in representation of scenic effect, be it modest or pretentious, the inclusion of water —if only trickling from shelving rocks into a pool below, or the more majestic torrent stream taking a course along a serpentine gully—has a particular charm of its own, and, where situated in secluded parts of the garden, is never without the association of birds in Summer time.

In hilly and rocky districts throughout the Eastern States there are to be found, in various quantities, the outcroppings of rocks invariably located on sloping ground. The individual rocks vary considerably, both in size and in the extent of the area where distributed. Therefore, the possessor of either a small or a spacious area of these partly buried rocks can plan to have a rock garden where facilities permit the inclusion of running water on an elaborate scale.

The result of the constructor's labor, if it is intended to represent something definite in nature, as a mountain stream, will be dependent upon the builder's knowledge of natural beauty and the representation of a true replica of the intention upon completion of the building.

The situation in a rocky district is cited for the reason that, while the superabundance of rock near at hand may not possess any marked beauty—as weather-worn or showing deep fissures —it often happens that a sufficient number of nicely placed rocks are to be found protruding from the earth in close proximity to each other, thus forming a central point of attraction in the prospective rockwork, whence water might fall into an excavated gully and then follow its course to the lowest part of the rockwork.

The matter of extending the rock structure on both sides and to the foreground of the central point is a comparatively simple undertaking, for in many instances the general contour of the ground will be retained, with the exception of the portion to be excavated for the water course or whatever design is to be effected.

Running water gives the rock garden a particular charm of its own

It is not necessary for a rock garden to be on an extensive scale to include running water. The volume of water should be in accordance with the proportions of the rock garden. A simple construction might have water trickling from higher rocks into a pool; and the more elaborate structure could display a forceful descent of water falling from rocks into a pool or pools overflowing into a stream which is crossed here and there by stepping stones

The placing of the rocks has heretofore been described with sufficiently complete details, so that repetition is unnecessary; and while the formation of the background will rest upon the individual site, with the possibility, in some cases, that above the sloping ground will be numerous desirable evergreen trees and shrubs which alone form an ideal setting, yet there are instances of similar sites where natural vegetation is conspicuously absent. In such a case the builder must choose shrubby material that will be in keeping with the situation. If the site is in an extremely remote part of the garden and not in proximity to formal phases of other branches of gardening, one may choose native Rhododendrons (evergreen and deciduous), Hemlocks and other selections of similar character.

A site such as described is by no means common in the average garden, and where one wishes to include running water in his rock garden, but where ground space is limited with no choice for an ideal situation within its area, he will make the most of the chances presented.

Plan and Development

We will proceed to build a rock garden of reasonable dimensions, which might be constructed or modified to meet the requirements of a rock garden enthusiast who possesses a garden of average size.

The situation we will assume to be a gradual slope, exposed to a southern aspect, but the original background, composed of saplings and wild herbage, is not altogether desirable in the formation of a pleasing setting. Hence, the removal of much of the growth will be necessary; and the substitution of other subjects will aid considerably in making the construction more interesting as it proceeds.

In our prospective structure we will have the water falling into a stream from some high and partially hidden rocks in the background and then taking a winding course through the rock garden to a miniature pool.

Proceeding with the construction, the ground being on a slope is not likely to accumulate water during the wet season;

From rock garden to lawn

An informal stone arrangement across the stream, the flat lawn surface harmonizing with the broken contour of the rock garden

therefore consideration regarding drainage bed from ground level is unnecessary.

The sloping ground should be broken up with a pick for a depth of two feet and all noxious weeds and undesirable matter cleared away from the site.

Attention is now given to the formation. The upward slope of the ground toward the background is of great advantage in the prospective picture, as the stream can be better viewed at a distance. We will therefore leave the formation as it is, with the ground broken up.

Proceed by excavating the gully, commencing at the highest and central point of the ground under the existing vegetation in the background and working in a winding course to the lowest part of the ground, where the first rocks will make the upward grade. The excavation should be considerably wider than the bed of the stream upon completion, for the reason that here and there at intervals will be placed large rocks fitting into the bank on either side of the stream. These rocks may be laid in position as the excavation proceeds. They should not, however, be placed in straight lines, certain ones being allowed to distinctly protrude into the stream, the rapidly descending water as it rushes against the rock causing ripples and more definitely revealing the presence of water.

The working procedure applies in exactly the same manner to both sides of the gully, and as the rocks are placed, provision must be made to insure the water taking the full distance of the course, without becoming lost in crevices between the rocks. The best method to adopt is to pack the soil perfectly tight within the crevices between rocks and then for a distance of a few inches up the crevice from the bed of the stream place a thickness of cement, colored to harmonize as nearly as possible with the color of the rock. Before the cement has a chance to harden, choose some small pieces of rock and fix these upon the cement as a camouflage. At whatever cost, the use of cement should not be evident.

The reason for using cement only for a distance of a few inches up the crevice is twofold. First, no more should be used than is

necessary. Secondly, the remaining distance from the cement to the upper surface of the rocks offers an ideal planting space for plants that thrive in crevices.

With the construction of the sides of the stream bed completed, we proceed to build the part whence the water is to begin its course. There are various methods that might be employed, each having a charm of its own. The water could simply fall from a flat-surfaced rock placed slightly higher than the underlying stream bed.

Another effective yet equally simple structure is an arrangement of rocks forming a semicircular wall rising from the bed of the stream to the required height from which the water begins its descent. This formation of the rocks is particularly pleasing, for not only will ferns (Polypodiums) thrive in the crevices, but the mysterious sound of descending water is echoed within the encircling rock wall.

Here the working procedure is to choose fairly square pieces of rock and fit them in the bed of the stream and on its banks so as to form an irregular semicircle. Probably a little excavation will be necessary. This gives a foundation to work on. Of course, the amount of rock to use will be entirely dependent upon the size of the individual structure and its proportional relation to the dimensions of the rock garden.

Now place a layer of soil a few inches in thickness over the upper surface of the rock, and, if it is desired to include ferns (Polypodiums), place them in the soil with their leaves hanging over the rock.

Choose next some thin, slabby pieces of rock and continue to build, planting at intervals, until the required height is reached. Do not place the rocks so as to form a perfect half circle; here and there fix a rock protruding beyond the others, in order to break up the symmetrical line.

We are now ready to lay the water pipe, which must not be seen. All that is visible to a visitor is merely the falling water.

There are various means and devices for making the water fall in the form of a spray—opposite to the usual way that water leaves a faucet. A simple method is to have the faucet lying

SPRING

Where beautiful colors rival each other and the gray sullen rocks look on

upon the upper side of a flat rock which has a rough or jagged surface, and at some distance (a matter of six to nine inches) from the front view of the rock, so that, as the water is turned on, the rock's rough surface over which the water travels will create a spray (in proportion to the volume of water) before its descent into the stream below.

At the rear of the semicircular rock wall prostrate evergreens should be planted, Juniperus horizontalis being especially useful, as it can be planted reasonably near to the rocks so that as progress in growth is made all that will be visible will be glimpses of rock between the branches of evergreen foliage.

Stream Bed and Pool

The actual bed of the stream is our next consideration. Excavate for the reception of each rock, selecting rocks of various shapes and sizes, some exhibiting smooth surfaces and others rou h. Alternate them, in order to prevent any set, rigid appearance of masonry. Fit the rocks comparatively near to each other, filling in the crevices with soil, which should be pounded hard, until within three inches of the rocks' surface. When all the rocks are laid, we resort to the cement, again being careful not to overdo its use and adding a color so that it will blend with the rock. Fill in the crevices with cement, not forgetting before it hardens to place coarse silver sand and small pebbles here and there, thus concealing any trace of the use of cement.

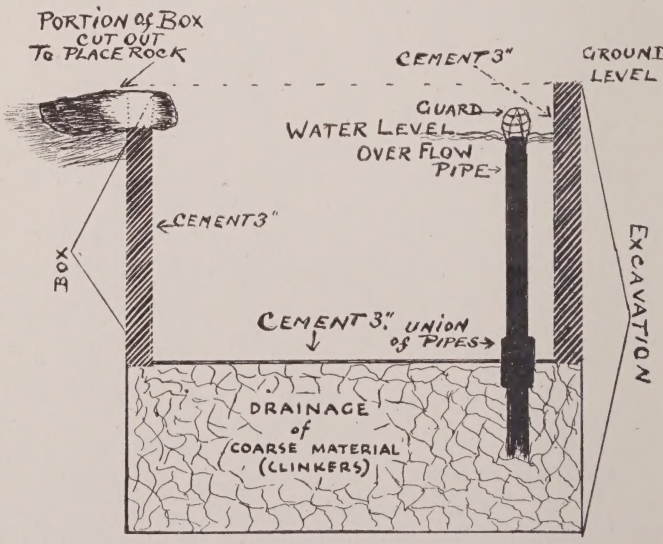
The next part of the construction is the pool where the water, after running along the stream bed, is to be deposited, and on overflowing, carried through a drain to the low-lying ground in other parts of the garden or into a ditch; or, if the water is running slowly from the faucet, as would be the case in a small garden, causing no great volume of water, then only a catch pit would be necessary to take the overflow.

Construction of the pool and of a catch pit for the overflow is comparatively simple. Excavate a hole much deeper than the actual depth to be occupied by the pool and fill in with coarse

clinkers to a distance that is to be the bottom of the pool. Then construct a wooden frame of the intended shape of the pool, its diameter to be six inches less than the width of the excavation, thus allowing a three-inch space between the framework and the sides of the excavation, for the purpose of filling in cement. When one is not particular regarding the shape, an ordinary wooden box will serve as the framework.

Place the box or framework in the hole and fill in with cement in the three-inch space allowed between the framework and the sides of the excavation. When the cement has set hard, the framework can be removed, thus giving the walls to our miniature pool.

Where a box is used for framework—possibly for economical reasons—portions of the sides may be cut away for the reception of rocks that are to be inclined over the edge of the pool. (See Figure 11a.)



Construction of a pool

Figure 11a

We now proceed with the floor of the pool and the overflow pipe. This pipe is in two sections. The lower part is a fixture extending downward from the cement floor of the pool into the drainage. The upper section, extending from the floor of the pool to the surface of the water, at the approach of freezing weather, when the water has been turned off, is unscrewed from the lower part of the pipe, liberating the water. The pool cavity is then filled with leaves, hay or other light material and covered with boards, to prevent the cement from cracking during the Winter season.

It will be necessary before placing the pipe in situation to remove some of the clinkers, in order to insure that the pipe is deep enough in the drainage bed. The top of the pipe, which is on a level with the surface of the water, has a guard attached to prevent leaves from entering the pipe and possibly causing a stoppage.

The formation of the bottom of the pool is begun by placing a thickness of about three inches of cement over the clinkers, taking care that it is packed close up to where the two sections of pipe are united, so that water cannot escape. Where one chooses, the bottom may be made concave by removing the clinkers and replacing with coarse ashes, which are to be covered with a three-inch thickness of cement.

When the construction of stream, pool and catch pit is completed, and the water faucet attached, all is in readiness for turning on the water which, beginning as a spray at the summit of the rocks, takes its winding way down the serpentine course and into the miniature pool.

A Rock Garden Situated in Natural Surroundings

By far the most interesting situation for a rock garden is one whose surroundings are associated with nature, as trees and wild herbage, and not within sight of the conventional phases of gardening in the manner of formal Rose beds or herbaceous borders.

Natural accumulation of rock in a woodland setting creates an ideal rock garden with situations for sun and shade loving plants

In the larger gardens, the limits of ground under cultivation are invariably the commencement of woodland; and in cases where rocks are present, often evident in hilly and rocky districts, they are found in groups varying in size from small pieces to boulders weighing many tons, deposited by some bygone avalanche. (See illustration above.)

The fissures between the rocks vary from a few inches to many feet in depth. Nature, in the course of time, has filled these openings with a soil rich in vegetable matter composed of decayed fallen leaves and fine particles of rock gradually worn away by climatic action.

Upon these beneficent, filled-in fissures, lichens, mosses and ferns find a kindly home, being assured of sufficient moisture and of shade from the surrounding trees which protect them from the fierce sunlight.

Where such groupings of rocks are present, there is an especially good opportunity for an ideal rock garden, in so far as the location is a natural one. Yet the enthusiast must construct his garden to be in keeping with such surroundings.

The environment or background to be chosen as a setting for the construction may be likened to the frame for a picture or the setting for a costly gem; one enhances the value of the other.

Further, to commend the importance of the situation, as rock gardening has hitherto been described as a new phase of horticulture in America, with a widespread call to "preserve the native wild flowers," there is an ideal opportunity for one to include in adjacent parts of his rock garden such of our most beautiful wild flowers as Cypripediums (native Orchids), Dodecatheons (the Shooting-stars of America), Erythroniums (Dogstooth Violets), Epigaea repens (the Trailing-arbutus) and others of equal beauty.

To collect and preserve our native plants and transplant them to an ideal situation would certainly conform, in a measure, with the principles of those who advocate the preservation of native wild flowers for, to a large extent, they would then be out of reach of the persons who are in the habit of thoughtlessly pulling the plants from the ground, only to use the flowers for a bouquet, while the plants themselves, which would perpetuate the flowers' beauty in time to come, are discarded to die a miserable death of starvation. Such destruction would eventually result in the extermination of those plants which for the present are held in high esteem as our most beloved wild flowers.

In considering the fashioning into a rock garden of a situation as described, the first part of the work would be the removal of several trees in order to insure sufficient light on the rock structure. The cutting down of trees should not be done in a haphazard way, but thoughtfully, for one is taking life. Trees such as the Silver Birch, whose leaves are too small to cast particularly dense shade, should be left, where possible, for their trunks or sapling stems are beautiful the year round, while their boughs and leaves through the Summer months are most graceful.

Having cleared the trees for a reasonable distance on the proposed site, we next proceed to clean out each individual rock fissure and pocket, throwing away the soil that is of no value. Some fissures will extend to a depth of ground level, varying in accordance with the position and size of the rocks; but it is unnecessary to take out the soil to this depth, so long as there is sufficient space to incorporate the mixture of good soil as heretofore described.

When all the fissures have been cleaned out, at the same time exposing as much of the rock's surface as possible, care should be taken to have the exposed surface show evidence of having been partly buried for centuries.

We now fill the empty spaces with the good soil, making it firm at the farthermost part of the fissure and working upwards. For the most part, certain necessary removal of trees has been completed, and all fissures have been filled with good soil, in which the rock plants are to be inserted.

Consideration is now directed toward the setting or background, which of necessity will be on the farther side—opposite the approach—and partly surrounding the rock garden, yet a considerable distance from the foot of the rock work.

Here again we have opportunity to use our own native flora, such as Rhododendron maximum, R. carolinianum, R. catawbiense, Azalea vaseyi, A. viscosa, Cornus florida, Kalmia latifolia and others of equal value. These may be planted in bold masses, at a reasonable distance from the existing trees or at distant parts of the rock garden. One might be desirous of also using exotic shrubs, as the named hybrid Rhododendrons and other easily purchased flowering shrubs. In selecting hybrid Rhododendrons, it should be ascertained whether or not they are hardy in the particular location for which they are intended.

In choosing shrubs for the background, give preference to broad-leaved evergreens, Pines and deciduous Rhododendrons, If such flowering shrubs as Spiraeas, Deutzias and Forsythias be included they will mar the value of the natural situation and tend to tame the wilds.

Primula frondosa

For beauty of flowers, ease of culture and hardiness, this charming Primrose ranks high among the hardy Primulas for the rock garden. The flowers are pale pink, with a distinctly darker pink eye, and are most effective where grown in a mass. The flower stems and the under sides of the leaves are covered with a farinose (mealy) white powder. Plant in a good depth of light, sandy, leafy soil mixture, in a sunny situation, where in hot Summer the long, white, fibrous roots can penetrate into the cool earth. Like P. denticulata, it is averse to an excessive amount of water lodging around its base

Then will come the choice of plants for setting out on the actual rock work. While all the rock plants previously mentioned would thrive and form great masses or individual tufts, according to their character of growth, there are others that would give an equal amount of satisfaction.

Inspiration is often the outcome of possession, and one possessing such an ideal situation would probably not be content to grow only such plants as Aubrietias, Arabis, Alyssum, Phlox (subulata) and some of the commoner Campanulas, which plants may be seen in everyday gardens adorning the edge of an herbaceous border or in a rock garden whose inhabitants are limited

to easily grown plants that may be purchased in the locality and where the owner's ambitions are limited.

While members of the foregoing genera are desirable plants and do in part contribute to the beauty of the rock garden during the Spring months, yet there are others equally as beautiful in flower and more so in leafage, as, for instance, the Androsaces and the silvery-leaved Saxifrages. Although they may not be so easily purchased from nurseries, they are not difficult to raise from imported seed.

Many delightful rock garden plants, different from the general run, are at the present time comparatively scarce, but in the instances of many genera may be easily raised from seed; these will be given further consideration in the chapter on propagation.

Corresponding to the situation we have in view will be found certain locations to meet the requirements of plants diverse in character, geographical distribution, soil taste and preference for sun or shade. Thus, a comprehensive collection of plants suitable for the rock garden and its surroundings may be brought together under these ideal conditions to enjoy the respective essentials to their welfare in peaceful association with nature.

Probably the first question the beginner asks, in considering the purchase of seeds as new additions to his rock garden, is by what means shall he know the proper subjects for planting in certain locations, be they sun or shade lovers, in view of his limited knowledge of rock plants and of their preferences? Catalogs of nurserymen specializing in rock plants usually specify the plants' requirements and general information regarding culture.

Consideration has now been given to the removal of trees, exposure of rocks' faces, cleaning out of fissures, incorporation of good soil and suggestions regarding the use of native shrubs.

Within close proximity to the shrubs, which serve as the setting, many beautiful plants, bulbs and tubers, indigenous to this continent, may be planted at intervals where they can continue to grow and form colonies of their own within shade of the nearby shrubs.

Springtime in the rock garden

Material suited to such plantings may be purchased from collectors, or in some instances found in their haunts of similar nature to that of the area they are to occupy when transplanted, the chances being that both soils would be identical.

The Wall Garden

Where banks of considerable length are present in gardens and their grade is too steep for the rock plant enthusiast to consider modeling into a rock garden for reason of the labor required in excavation, or where it may be of advantage for the grade to remain in order to hold the bulk of the soil, the building of a rock wall might be considered.

A structure of this nature planted with floriferous trailing subjects is a sight in Springtime that only few phases of gardening can equal in beauty; and when the flowering period is over, many of these wall gardens are attractive in leafage.

The foliage of the Sedums in their various colors, ranging from deep green to bluish-gray, and others of reddish-brown hue, have an ornamental value from Spring until Autumn.

The Sempervivums have an attraction shared by few other plants. Their thick, succulent leaves, formed in rosettes and of different sizes according to variety or species, are more alluring than the flowers themselves. The curiously woven cobwebs, intricately made up from leaf to leaf, are beautiful the year round, while other Sempervivums have their rosettes made up of smooth leaves exhibiting different colors as to the particular variety—some dull green with red tip, others a dark red covered with gray sheen, still others deep green throughout.

The Saxifrages, too, are captivating in color and formation of leaf. However, the hard-leaved varieties are not sufficiently grown by nurserymen to be enjoyed by all. But there is one, Saxifraga macnabiana, whose beauty in flower and leaf warrants the attention of all rock plant enthusiasts and can be purchased from most hardy plant nurseries.

One point strongly in favor of a rock wall is the sufficiency of planting material which is hardy, admirably suited to the purpose, and easily obtainable from local nurserymen.

A wall garden in Spring planted with Iberis, Aubrietias, Alyssums, Dianthus caesius and Saponaria ocymoides

Dry wall planting as it should be done

The construction of a rock wall is not a difficult task and can be undertaken by the individual himself, in accordance with the space available for his project. The size of the rocks need not be larger than could be conveniently handled. Of course, where one is building a comparatively high structure with possibly a great bulk of earth behind the prospective wall, larger rocks would be necessary, more especially at the base.

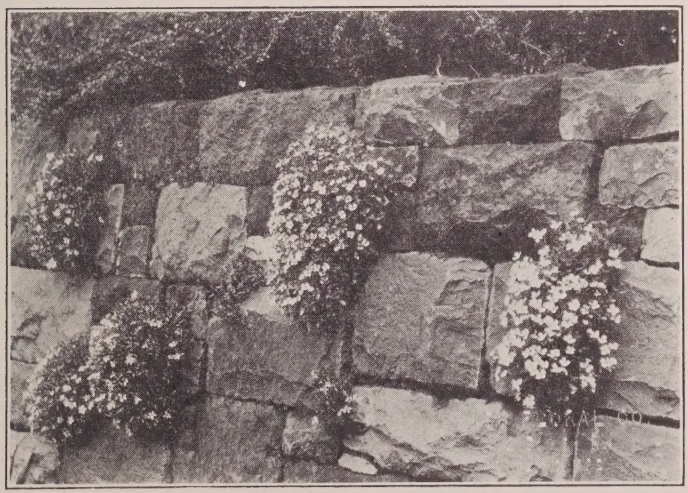
It is frequently observed, in front of houses in close proximity to cities, that the ground is terraced—probably in three terraces from the house down to the road pavement. This ground with sloping sides is generally planted with grass, a flowering shrub set out here and there, and the upper terrace usually planted with evergreen shrubs.

Such a situation, especially if favored with the full day's sun, would afford splendid opportunity for a wall garden. Even though the extent of the ground be only thirty to fifty feet in length, with a depth of four to five feet, it could be converted into a fascinating wall garden, not only giving unbounded pleasure to its possessor, but presenting a delightful spectacle to the passerby during the Spring months when it would be one riotous blaze of color!

In larger gardens banks are often in evidence separating various parts, as vegetable from flower garden, or herbaceous borders on high ground from the formal beds on the lawn, and so on. Likewise, these banks usually are retained in grass or prostrate shrubs, and a wall garden would change the scene in its entirety to something more interesting for one's admiration.

The wall garden has many features to commend its value. The adaptable plants give a greater show of color than other subjects that might be used in such a situation, and once a wall garden is substantially built and planted, there is no immediate labor further than cutting back some of the freer growing varieties that trespass on another's territory.

The rock for the building of a wall garden may be of the same nature as that prescribed for the rock garden, although it need not possess any particular beauty, such as stratification or weather-worn appearance. However, it should be long enough to fit firmly on the rock beneath, in order to overcome any pos-



Fine example of dry wall planting

sibility of its bulging either from the weight of earth back of it or from alternate freezing and thawing. Such result would be a calamity to that part of the structure.

Avoid building the wall with round stones, as it is a difficult task to make them set well, owing to their circular surface; too, they have no particularly interesting character. Probably the builder will collect the rocks nearest at hand, in rocky districts where he would perhaps have choice of material of suitable size and shape. He should choose wedge-shaped pieces with fairly large ends, these large ends to be exposed to view on the rock wall.

Flat rocks two or more feet across their surface and but a few inches in thickness are of little use in the rock garden, apart from their intention as stepping-stones, and yet they are admirably suited for building a wall garden.

Rock of this nature is certainly more conveniently handled, and providing the builder does not have the planting spaces too wide, the possibility of falling rock is overcome through the amount of surface extended toward the bank.

Soil

Situations and rocks having received consideration, thought should now be given to the soil into which the plants are to be inserted later on. No mortar is to be used in the building; simply layers of rock and soil until the desired height is reached.

Good ordinary garden soil may be used, to which well decayed manure should be added in proportions of three parts of the former to one of the latter.

Construction and Planting

The procedure dealing with the construction of a wall garden is applicable to structures large or small.

A garden line should be stretched out to the extent of the prospective wall, and some little distance from the bank. The distance between the bank and the line will be dependent upon

the size of the rocks, but leave sufficient space to insure tightening the soil at the back of the rock.

Then proceed by excavating the portion marked out to a depth of six inches, leaving the bottom of the excavation solid.

Now, choose the larger pieces of rock, square if possible, and place them in the excavation with the part to view fitting close up to the line. The distance between the rocks, forming a vertical fissure of only a few inches, should be filled in with soil and tightly packed. This part of the work gives a solid foundation upon which the wall is to be built.

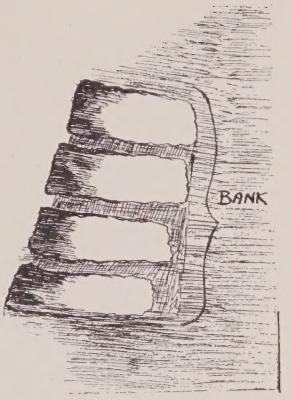


Figure 12—The wall should not be vertical, but slightly receding toward the bank

Before proceeding with further placing of rocks, one should bear in mind that the wall must not be built vertically, for reason of the weight of earth behind and, further, each rock is to be tilted up at the front so as to incline into the bank, in order that rain falling on the edge of the rock will follow the course of the rock and be conveyed to the plants' roots. (See Figure 12.)

It is recommended that the plants be set in as the building progresses. This enables the builder to spread out the roots of the plants to their fullest extent, thus making sure that the soil is tight around them; whereas, if planting is carried out on completion of the building, it is not an easy matter to take out the soil within the crevices, set in plants, and feel sure that the farthermost parts of the roots are being firmed, even if covered with soil. (See Figure 13.)

Resuming construction, place a depth of the prepared soil over the above surface of the rocks, filling in every crack and crevice, and making sure that the soil is perfectly solid between the bank and the rock. Now, the first line of plants should be

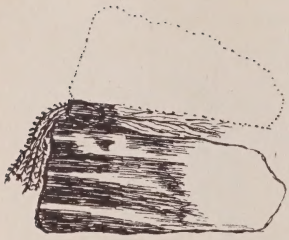


Figure 13—Showing the roots spread out to their full length. Surround with earth and make firm before proceeding to place the upper rock

set in place, by making a depression in the soil on the rock, leaving a depth of a few inches. Then set the plant in the depression, with its foliage hanging over the rock and its roots spread out. The soil that was removed to make the depression should be placed on the roots and sides of the ball of the plant.

The line used for marking out the length and width of the wall should now be stretched out to act as a level for the next layer of rock, so that, as building progresses, one rock will not be higher than another. Then proceed with placing the next layer of rock, and as each rock is placed, subject it to pressure, in order to further tighten the plant and soil below. (See Figure 14.)

Of course, plants will not be set in on the above surface of each rock, for in some cases, where the rocks are comparatively narrow in the portion exposed, the plants would not have sufficient space to make growth that would show to advantage. The distance to plant from one subject to its neighbor should be determined by the nature of the plant. While the Sempervivums could be planted in all chinks and crevices, Saponaria ocymoides would command considerably more area in a growing season.

Plantings of Sedums and Sempervivums could be left over until the building of the wall is completed. They are indispensable in rock and wall gardens, always attractive in their coloring and perfectly contented in any dry location.

As the top of the wall is reached, what might be planted there will depend upon the actual situation. For instance, in the terraced garden with the highest terrace probably in close proximity to the main windows, hence in full view, low-growing subjects should be planted; but, in cases where the rock wall is separating one part of the garden from another, slow growing evergreens could be used to advantage.

IN HARMONY WITH NATURE

A rock garden situated in natural surroundings affords a peaceful setting to the rock structure—a place where many of our beloved wild flowers nearing extermination may be planted in close proximity to their exotic cousins, and their beauty preserved for times to come. Here they are out of reach of those persons who, intending to gather but a bouquet of flowers, thoughtlessly pull the entire plant from the ground, entirely oblivious of the fact that such acts will in time mean the extermination of the individual species. The native Orchids are oftentimes victims of such treatment

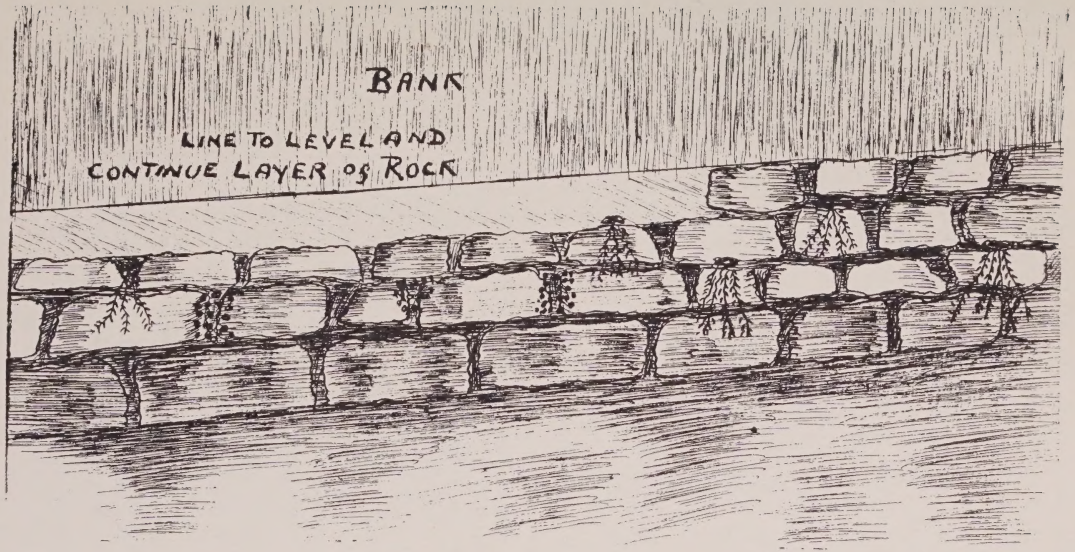


Figure 14—The wall garden under construction, showing plants inserted as building proceeds

The enthusiast would do well to make his choice of subjects for his wall garden from the subsequent list. They have been selected for their hardiness, ease of culture, beauty of flower, and facility of purchase.

In setting out the plants, do not overcrowd them to gain a quick effect, covering the wall with greenery until little or no rock can be seen at the end of a growing season. Know the subject you are planting—whether or not it makes little or much growth during the Spring or Summer. Then, as to color, set out each plant so that it will not clash with its neighbor.

Planting material has a wide range of color, from deepest blue to brightest yellow and pure white, with intermediate shades of lavender, rose pink, pale yellow and mauve. Therefore, there is no tint or tone wanting to make a mass of glorious coloring throughout the Spring and early Summer.

Alyssum alpestre, yellow
Alyssum saxatile, yellow
Arabis albida, white
Arenaria montana, white
Aubrietias (in variety), blue, pink, lavender
Dianthus caesius, pink
Dianthus deltoides, pink
Gypsophila repens, red
Helianthemums (in variety), red, white, yellow
Iberis sempervirens, white
Nepeta mussini, lavender
Phlox subulata (in variety), blue, white, pink
Santolina incana, yellow
Saponaria ocymoides, rose pink
Saxifraga macnabiana, creamy white
Sedums, any varieties as heretofore described (see page 26)
Sempervivums, any varieties as heretofore described (see page 29)
Silene schafta, rose pink
Thymus citriodorus, purple
Thymus serpyllum coccineus, crimson
Thymus serpyllum album, white
Tunica saxifraga, rose
Veronica incana, blue

Chapter V

Propagation of Rock Plants

ROCK gardening and the culture of its inhabitants have only come to the fore in America within recent years, and, as heretofore mentioned, plant material is limited. Therefore, a rock garden other than one of modest dimensions is difficult to furnish without constant repetition of certain genera, which means that the flowering season is reduced to a minimum and there is one riot of color for a short period, chiefly participated in by Phlox subulata and varieties, Aubrietias, Alyssums and Cerastiums; then, possibly, no more coloring in the rock garden—the season is over and one can only dwell upon memories until the forthcoming Spring.

A rock garden is decidedly at its best during the Spring, but if the enthusiast will search farther afield, he may procure plant seed that will give flower during the Summer months and oftentimes until the approach of Winter.

To mention a few genera that give color and interest to the rock garden when the main showing is over, one may suggest the smaller Campanulas, with range of hue from blues of deepest dye (C. pulla) to pale China blue (C. pusilla) or a creamy white (C. pusilla alba.)

Then there are the Violas, each of much the same habit in growth and with persistent flowers throughout the Summer months until the chill of Autumn. The Violas, too, have a wide extent of color, varying from deep blue (V. gracilis) to yellow (V. gracilis lutea), pure white (V. gracilis alba), and rosy purple (V. bosniaca).

Of the Silenes worthy of mention for Summer flowering, are S. alpestris and the double-flowered variety, S. alpestris fl. pl., both bearing white flowers through July and August, also S. schafta, whose flowers are bright pink.

Also the Gentians, difficult as they are reputed to be, should not be excluded from the beginner's rock garden because of the reputation they bear until a trial has been made. At least one of the Summer flowering kinds should be grown. As an instance, Gentiana farreri, with its large funnel-shaped flowers of China blue is a rare gem for the rock garden, flowering through August and the early part of September. (Grow in loam and good leafmold with sharp sand added.) The Gentians are not easy to grow from seed and success for the most part is dependent upon freshly harvested seed.

The four genera mentioned, Campanula, Viola, Silene and Gentian, as instances of what might be grown in order to extend the flowering period from the main showing in the Spring until Autumn, are suggested with a view to emphasizing that while Spring is the time when the rock garden is one glorious pageantry of color, it is possible to prolong the flowering season until the last flowers defiantly wave their colors through the cold Autumnal days. Ceratostigma plumbaginoides, a beautiful plant, at its best in late September, bears flowers of a glorious blue, its leaves, as the cold days approach, turning to a bronze green.

Rock gardening in America is still in its infancy. The years do not show any decided advancement over the previous season; and hardy plant catalogs continue to list the usual limited amount of plants adaptable for rock work.

Occasionally one does meet with hardy plant lists containing such ideal rock plants as Primula marginata, Saxifraga irvingi, Ramondia pyrenaica and Soldanella pusilla; but these lists are not so numerous as to readily fall into the hands of the beginner. Therefore, with the difficulty in purchasing plants, which invariably are high priced, the enthusiast might consider raising his own plants from seed.

Raising Rock Plants from Seed Sown in Greenhouse

Rock plants in many cases are easily raised from seed. It is interesting, even fascinating, from day to day to watch the progress of a pot of seed from germination to the stage ready for pricking off into pots or pans, until finally they are of flowering size and planted in the rock garden.

For one who would venture further with rock gardening and who seeks to procure seed of rock plants, it would be advisable to get in touch with botanical stations and leading seed merchants for further information as to where their requirements can be purchased. Any first class seed house will cheerfully answer inquiries.

Some rock plants are shy to set seed and the purchaser must not expect to receive as many seeds in a packet as he would by purchasing seed of annuals or herbaceous plants.

A great majority of rock plants have minute seed, and soon lose their vitality if left unsown very long. An important factor aiding in germination is to sow the seed as soon as ripe; that is, during the following Autumn or Winter, preference being given to Autumn, where seed can be purchased in time. Any of the Anemones, if left over the Winter and sown in the Spring, will most probably not germinate for a year, and then unevenly.

There is much controversy of opinion in raising rock plants from seed. While one would never consider sowing seed in pots and placing in a cool greenhouse, 45 degrees Fah. night temperature, preference would be given to sowing in garden frames.

It is my conclusion that the method by which one can get the highest percentage of seeds to germinate in the shortest time is the best, be it practiced by botanical garden, nursery or private estate. Slow germinating seeds, such as Anemones and Ranunculi, are often excited into growth by the action of frost and a covering of snow and then suddenly exposed to heat. This will be given further consideration later on.

The following is the method I have adopted for raising rock plants from seed, including lowland plants and plants of higher

mountainous regions, and I have met with considerable success—sufficient to warrant the procedure being worth while—having succeeded with such genera as Ramondia, Androsace, Saxifraga of the sections mossy, encrusted and kabschia, Meconopsis, Primula, Omphalodes (Luciliae), Gentiana, the smaller Dianthi and many others of equal merit.

The seeds, for the most part, are obtainable about the middle of October and should be sown at the earliest opportunity. However, they should be ordered well in advance as some of the rarer kinds may have to be imported.

First there is the writing of the labels. Each label should bear the name of the seeds, date sown, and probably where purchased, for future reference.

Then will come the size of pots. Three and one-half inch pots are large enough to contain the seed of most subjects and will not be overcrowded. The pots should be perfectly clean inside, for preference using old pots (those that have been used before) rather than new ones, which are so porous they constantly take up the moisture from the soil within, even if they have been given considerable soaking in a pail of water previous to using. The pots should then be crocked to one-third of their depth to insure drainage. Place one large piece of crock at the bottom of the pot, concave side downward and over the drainage hole. Upon this place a layer of gravel or small pieces of broken pots, and then a layer of Sphagnum or decayed leafmold. In part this will give perfect drainage. (See Figure 15.)

Then follow with the soil mixture. This must be light, one that will hold sufficient moisture and allow any superfluous water to pass through to the drainage. An ideal mixture for the majority of rock plants is made up of turfy loam, well decayed leafmold and coarse sand in equal parts. All these should be thoroughly mixed together and put through a one-quarter inch sieve.

There are some rock plants which do not so readily make satisfactory growth after germination in an ordinary soil mixture, unless a further ingredient is added. Anemone pulsatilla, even

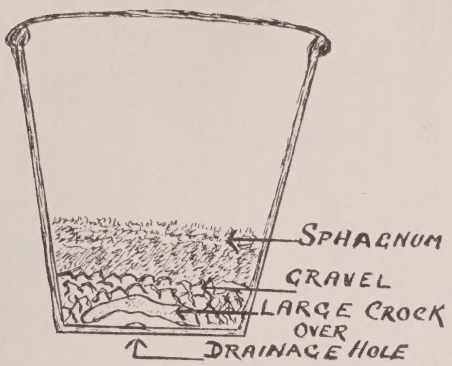


Figure 15—Section through pot showing different layers to insure perfect drainage

in the seedling stage, makes comparatively long roots, and the seedlings show a marked difference with the addition of old mortar in the soil. This also applies to the Aethionemas.

Ramondias and Haberleas, both peat and shade loving plants, should have peat in the soil mixture.

The Drabas enjoy a very gritty soil of sharp particles of coal ashes and sifted mortar rubble.

The greater majority of rock plants, such as the beginner would probably select, will germinate and thrive in the prescribed ordinary soil mixture.

The soil should be placed in the pots with the surface of the earth one-half inch below the edge of the pot. Not only is this convenient for retaining moisture and protection to the seed, which would not be received if the pot were filled to its fullest capacity, but there is further value: the pots containing rarer subjects may be covered with a piece of glass, thus overcoming the possibility of injury to the seed through evaporation taking place in the soil.

As the soil is placed in the pot it should be made firm and the surface evened. An ideal tool can be easily made to suit both purposes. Cut a circular piece of tin to a size a little less

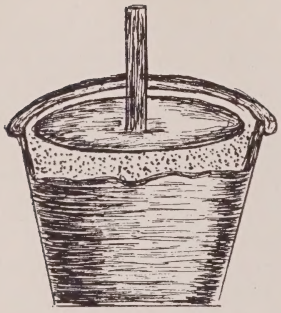


Figure 16—Portion of pot cut away to show use of tool in firming the surface and making it even, or for pressing seed into the earth

than the circumference of the pots. Nail this disk to a piece of wood long enough to make a convenient handle. (See Figure 16.)

When all the pots are filled with soil, as directed, they should be given a thorough soaking. If there is the slightest reason to suspect fungi in loam or leafmold, boiling hot water should be used —not merely hot but *boiling* water. The pots should be left to drain for at least twelve hours before the sowing is commenced.

When the pots have drained, the seed may be sown. As the seeds of most rock plants are very minute, it is advisable to mix with them a small quantity of sand. This enables the sower to distribute the seed evenly. The very small seeds need little or no covering of soil, but simply require pressing into the earth with the tool already described (See Figure 16). As the tool or tamper is pressed on the soil to firm the seed, care should be taken that none of the seeds adhere to the tin. Such as remain on the tin should be rubbed off by hand, on to the potted soil, before proceeding with the next subject.

Of course, all seeds are not so minute and some will require a covering of earth. A sieve with very small holes is most useful, as it allows only tiny particles to pass through and there is little danger of the soil going through so fast as to fall on one particular part, with the liability of covering some of the seed too deeply. All that is required is the merest covering; and then make the soil surface firm. As the pots are so small they are likely to dry out in a short space of time, and for that to happen while the seeds are germinating would be fatal. Therefore, it is a good plan to place the pots in a flat, having sufficient

space between them to surround each pot with peat, leafmold or soil, and so conserve the moisture in the pots.

The flat containing the pots of seed should then be given a place in the greenhouse, with a night temperature *not exceeding forty-five degrees*, covering with papers as the heat of the sun increases. The reason for covering with papers is twofold: first, to check evaporation, and, second, to assist in germination, as the heat rays of the sun retard the process.

In about three weeks one may look forward to the appearance of some of the seedlings. Previously it may have been noticed that the surfaces of some of the pots were becoming dry; do not use a watering can, however fine the spray may appear to be. Remember that the seeds are fine and have had only the slightest covering, if any; therefore, it is wise to stand the dry pots in a pan of water where capillary attraction will by degrees take up the water. When it is noticed that the surface is wet enough, the pots may again be placed in the flat of peat and covered with paper.

As the seedlings grow they should be given light by degrees, and it is necessary to take precaution at this stage with the water. See that the soil is not too wet, for the seedlings are now liable to be attacked with the disease known as Pythium, otherwise known as damping-off of seedlings. It is influenced by a humid atmosphere and indifferent watering. When this unfortunate happening does occur, sprinkle charcoal or fine dry sand between the seedlings, avoiding excessive watering, and as soon as possible prick off into pans or pots.

The proper time to prick off the seedlings—a task requiring much patience—is when they have made their second pair of leaves. Yet the procedure as here explained enables the operator to discover, after completing a few pans, that the work is comparatively simple, although it can never be hurried along in a haphazard way.

A good practical method for taking the seedlings from their places of germination is by means of a dibber and a lifter. As the dibber is inserted in the soil to loosen the roots, the lifter

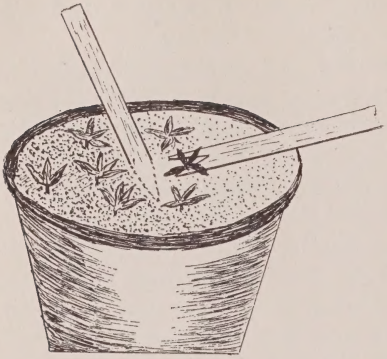


Figure 17—Dibber and lifter taking seedling from place of germination

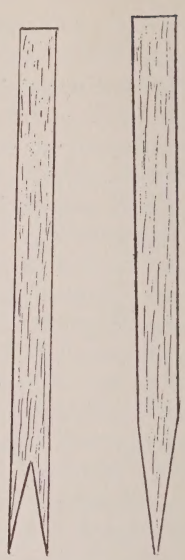


Figure 18
Lifter Dibber

is placed at a point under the plant between the soil and the first pair of leaves, the transfer then being made without injury. (See Figure 17.)

Both dibber and lifter can be made out of a garden label of convenient size to handle and of a thickness best suited to the subject which is to be pricked off. (See Figure 18.)

In setting in the seedling, make a hole with the dibber deep enough to take the full length of the roots and wide enough to prevent the roots from being cramped. (See Figure 19.)

Then, with the seedling on the lifter, place it in the hole and push the dibber straight down near the base of the seedling. Withdraw the lifter and proceed to fill in the depression. Care should be taken to make sure that the dibber, in tightening the seedling, is pushed far enough into the soil to close the hole that was made to receive the seedling, or the seedling will be hung with an air space at the farthermost part of the roots. (See Figure 20.)

It is advisable to give the seedlings at least one move before being planted out in their final quarters in the rock garden.

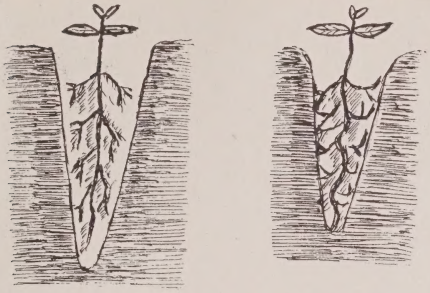


Figure 19

Right Method Wrong Method

The move, whether into pans, pots or boxes, will depend upon the nature of the individual subject. To describe the requirements of all would necessitate more space than is here permissible. Briefly, however, one may be guided by the following:

All subjects of a robust nature, such as Primulas bulleyana, japonica, denticulata and those of similar growth in the genus, Aquilegias, Meconopsis, Papavers and the stronger growing Dianthus, should be set out in flats from which they may be planted out in a garden frame on beds where they can be given necessary attention, shading and watering, until the plants are strong enough to be set out in the respective places where they are to flower. Any good garden soil, to which leafmold or well decayed manure and coarse sand has been added, would be admirably suited for a compost. There is nothing to be gained

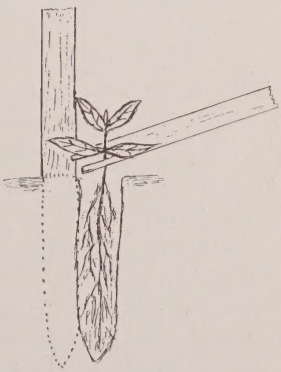


Figure 20—Showing seedling suspended on lifter, the dotted line representing the portion of dibber pressed into the earth to the fullest extent of the roots, thus closing the hole

Primula japonica growing on a shaded bank

by planting the subjects in their intended places for flowering until the plants are strong enough to withstand all weather conditions.

Such plants as any of the silvery-leaved Saxifrages, smaller Dianthus, Sempervivums, Leontopodiums, Silenes, Sedums, Dryas, Erodiums and Phyteumas should be pricked off into pans, with a space of one inch between each seedling. When they are large enough to conveniently handle, they should be potted separately in two and one-half inch pots. The pots should be crocked in the same manner as described in the preparation for seed sowing.

The compost used for potting should be light and open for the hairlike roots to penetrate, and retaining sufficient moisture for the small plants' subsistence.

The procedure in potting is quite simple. Take the seedling from the pan, using the label or lifter and taking care not to break off any of the fine roots. Fill the pot to a little less than

half its depth, then, holding the seedling with thumb and forefinger of the left hand, place the plant in the center of the pot and proceed to fill in soil around the plants' roots. Now, with both thumbs bring pressure upon the soil around the plant, at the same time keeping the plant in the center of the pot. Then fill in the depression with more earth, leaving sufficient space for the plant to be watered. Finally, holding the pot firmly, forefingers at its edge and thumbs pressing upon the soil near the plant, hit the base of pot squarely on the potting bench. This gives the plant a further tightening by pressing the soil firmly to the roots.

When all the plants are potted and weather is favorable, they should be plunged to their full depth in an ash frame, and kept closed (not a free circulation of air in the frame), shaded and watered until there are signs of growth, and then air should be admitted by degrees as growth progresses.

Here again the plants should be well established before going to their final quarters. It is surprising to note the amount of fibrous roots these little plants will make in an ash frame, penetrating the cool ashes for an incredible distance and giving one reason to believe that clean coal ash would be beneficial in soil compost in rock gardens, used at a depth where its presence would not be visible.

In cases where the seeds have been sown in October, and at the end of January, there are no signs of seedlings coming through, collect all such pots, and, when a flaky snow comes along, stand the pots in a frame outside. If a few degrees of frost are evident, all the better.

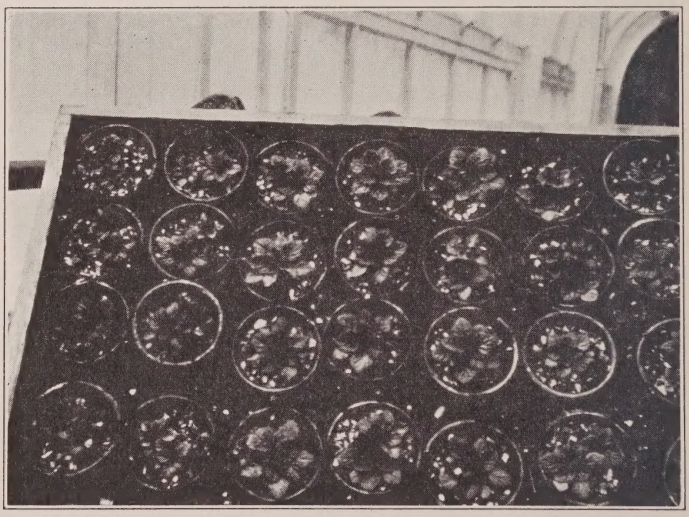
When the pots are thickly covered with snow, put the frame glass on and cover to exclude the sunlight from melting the snow. Let the pots remain in the frame for three weeks, taking precautions to cover the frame, so that excessive frost may not enter and freeze the soil solid in the pots, thereby causing breakage. Then take the pots, covered with snow, into the house. The extreme temperatures and the melting snow will in most cases bring about germination.

Possibly what happens is that the snow, upon melting, softens the testa (outer coat of seed) and the sudden heat excites the embryo into growth.

Rock Plants Raised from Seed, Sown in Pots Out of Doors

It is by no means necessary for one to be in possession of a greenhouse in order to raise rock plants from seed. The foregoing, more especially the part dealing with the sowing and care of the seeds in the greenhouse (See page 85), is based upon personal, practical experience, and, as previously mentioned, germination was of high percentage.

The illustrations of Ramondia pyrenaica (See below) and



Ramondia pyrenaica

Plants, two and one-half years old, raised from seed sown in a cool greenhouse, and ready for planting in situation where they are to flower. The more time it takes a plant to attain flowering size, the longer its natural life. (Compare this illustration with that of Saxifraga cotyledon icelandica, both same age). Ramondias thrive in a soil composition of loam, peat and coarse sand in equal parts, and are planted in a vertical crevice in a shady part of the rock garden. The leaves of the plant form into neat rosettes that fit closely to the ground, and one must be cautioned to see to it that an amount of water is not allowed to lodge about the leaves. The flowers a purplish mauve, carried on 4-inch stems

Saxifraga cotyledon icelandica (See pages 96 and 97) are but two instances in favor of sowing in a cool greenhouse. Incidentally neither genus was subjected to the snow treatment.

Therefore, with such evidence, the beginner who possesses a greenhouse would do well to sow his seed as described and place the pots or pans in the greenhouse, in a cool growing temperature. Here the more impatient subjects might be started into growth and perhaps continue to make progress until, as the warm weather comes along, they will in many cases be of good size for planting out in the rock garden.

The use of a garden frame is another method that might be employed for raising rock plants from seed. It has an advantage for those who are not in possession of a greenhouse, although such subjects as would germinate readily in the greenhouse are retarded by the cold. Yet there are others that would greatly benefit by the alternate action of frost and subsequent melting snow. Plants of this nature, however, would be in the minority in the beginner's collection of seeds, as they include true Alpine plants found growing on high altitudes, above sea level.

The frame that is to contain the seed pots, when sown, should be partly filled with sifted ashes, into which the pots should be plunged to their full depth, taking care that the ashes are not above the edge of the pot, lest they fall into the pot and completely bury the seed. For economy of space, the pots might be fitted into the frame with their edges touching each other.

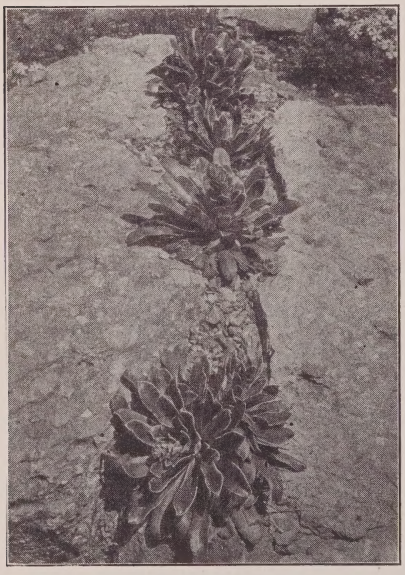
The best way to set out the pots is to have a straight piece of board about four inches wide and a little less than the frame's width in length. Place the board flat on the ash bed and then turn on its edge where the first line of pots will come. Move the board up and down the frame's width to clearly mark a line in the ash.

With the use of a trowel, proceed to set in the pots; if all are of the same size, it will make the plunging more convenient and add to the general appearance.

The seeds should be given the necessary attention that they would have in the greenhouse. Shading and watering should be watched closely until the sun's strength lessens with the

approach of cold days, when only those pots which are really dry should be given water.

In the Autumn the seed pots in a frame do not dry out so readily as during the Spring months, and the greater of two evils at this stage, long before germination, is to have the pots too wet. To avoid rotting of the seed, it is far better for them to be slightly dry, although the ideal condition is that the compost in the pots should be only moist.

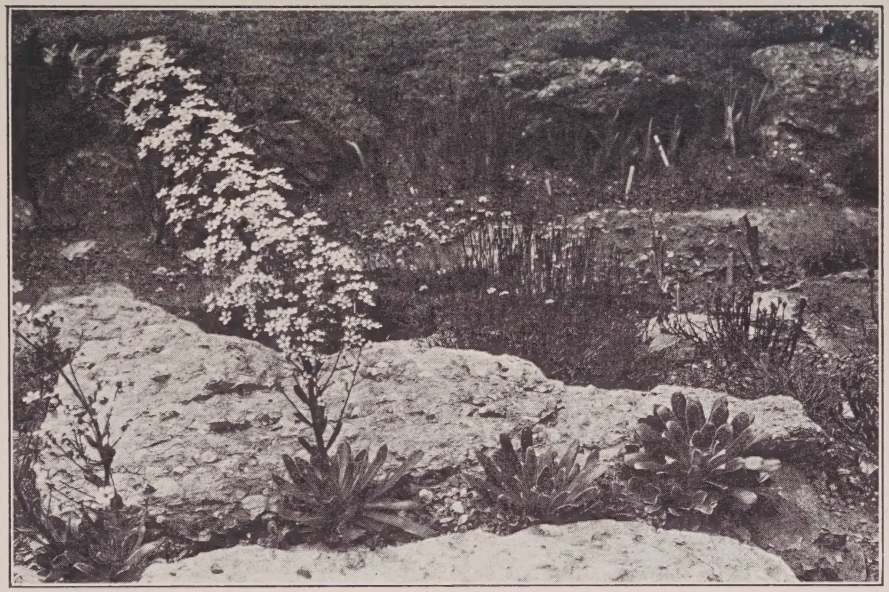


Saxifraga cotyledon icelandica

Raised from seed sown in a cool greenhouse. Plants are two and one-half years old, growing between two rocks forming a horizontal crevice. Although there are no visible signs of the plants' source of subsistence, the crevice is filled in with a mixture of loam, granite chippings and mortar rubble for a depth of two feet, assuring the inhabitants of sufficient nourishment to a depth that is not likely to dry out on the hottest day. The flower spike is exceedingly beautiful, measuring from 24 to 30 inches in height and covered with exquisite white flowers, while the straplike foliage, formed in rosettes, is most picturesque

Water at this stage will not accelerate growth. Probably a few of the free and easy subjects will germinate here and there, but the majority will show their aversion to a wet compost by failing to germinate in the Spring. When it is noticed that some of the pots are quite dry, they should be taken out of the frame and placed in a receptacle of water, and, when sufficiently wet, removed from the receptacle, left to drain and then placed back into the frame.

Before the cold weather sets in, if the enthusiast is in a locality where the thermometer registers below zero, causing the frost to do damge to the pots through breakage, some



Saxifraga cotyledon icelandica (In flower)

This is truly a majestic Saxifrage, with its towering spire of numerous white flowers. After flowering, the rosette, whence the inflorescence ascended, dies and, before the gradual decay of flowers, leaves and stem, several offsets (miniature rosettes) are sent out from the base of the parent rosette. These offsets, inserted in sand, rooted and grown to a size for setting out, will perpetuate the beauty of the parent plant. The procedure takes considerably less time than raising from seed

precautionary measure should be taken and protection afforded.

This can easily be done by nailing a board structure around the frame for a width of one foot out from the frame; then fill in the partitioned space with leaves or hay, made firm by treading.

When very cold nights threaten, any material, such as bags or whatever will tend to ward off excessive frost, can be thrown over the glass.

With the arrival of a flaky snowstorm, take off the glass and let the snow fall on the pots for a considerable depth. It is far better to allow the snow to fall into the frame naturally than to resort to shoveling it in from accumulated snow near the frames. The chances are that in the latter case cinders or other undesirable matter would be incorporated with the snow in the frame.

Now comes the question of preventing the snow melting in the frame. This is a comparatively simple problem if the situation has a northern exposure; but with a southern site, where the frame is in view of the full day's sun, one confronts a real perplexity. The best way to deal with the difficulty is to exclude the sun's rays from the snow by shading and taking advantage of falling snow.

As Spring approaches, the snow should be allowed to melt away, and when it has gone the glass of the frame should be allowed to attract a natural warmth from the sun until the temperature in the frame rises as high as 50 degrees Fah., when air should be allowed to circulate freely (provided it is not too cold outside) by putting a small pot under the center of the glass framework.

The frame should be closed down early in the afternoon, so that sufficient heat may have accumulated to keep the temperature up during the night; then follow previous day's procedure.

As the inside of the glass becomes covered with vapor and globules of water, due to heat and evaporation, the glass should be removed and dried. This is of utmost importance, for, while the seed will germinate under such conditions, their growth will be terminated by the disease heretofore mentioned, Pythium, or damping-off of seedlings.

Sowing Seed Directly in Frame

The sowing of seed directly in a frame of prepared soil is sometimes practiced, although this method has its disadvantages. While one subject will germinate in a reasonable length of time, another will take considerably longer; also, the removal of those seedlings ready to prick off would probably result in covering other seed too deeply.

In contrast to the preceding, seed sown in pots and plunged in ashes can be given individual attention without chance of injury to its neighbors.

Propagation by Cuttings

Most rock plants are propagated with comparative ease by cuttings, and once a few plants are established from seed or purchase, propagation by cuttings will give a plant of flowering size in less time than raising from seed.

The simplest subjects for the beginner to try out are the Sempervivums and the Sedums. Small rosettes of the former, severed from the main stem of the parent plant, will root and form independent plants in a few weeks and send out rosettes from their base.

The Sedums, too, are quite simple. Short pieces of stem, about two inches long, inserted in sand will spread and form a dense mat in a reasonable time. Most of the Sedums are so easily propagated that it would save much time to multiply them by division, these divisions to be either straightway planted into their permanent places, or potted and planted later. But the majority of rock plants are not so easily accommodated and a specially mixed soil for their reception in a garden frame is necessary to meet with any certainty of success.

Preparation of Frame

The first consideration throughout this part of the work is given to the preparation of the frame containing a soil composition that will retain moisture and yet be of an open nature.

An ideal mixture for a cutting frame may be made up of two parts coarse sand, one part well decayed leafmold and one part good loam. All three should be well mixed together and put through a one-quarter inch sieve.

The frame need not be an elaborate structure, provided it is deep enough and the glass well glazed to prevent rain dripping through the cracks on to the cuttings, which, if excessive, would not be to their advantage, especially soon after they have been inserted.

Frames for the purpose are usually partitioned, having a depth of eighteen inches at the back and nine inches at the front, with a width ranging from four to six feet and a length to suit one's needs. The working procedure in preparing a frame is as follows:

The bottom of the frame should be broken up and decayed leaf or well rotted manure incorporated for a depth of nine inches. Upon this layer will come the soil mixture for a depth of four inches at the deepest part and raked to the front of the frame, the surface having a gradual slope downward toward the front. This not only will afford better drainage but each cutting will receive an equal amount of light. The contents of the frame should now be made firm and the surface evened, followed by an inch of clean, coarse sand spread over the surface, into which the cuttings are to be inserted. Give a good watering and all is in readiness for the cuttings. (See Figure 21.)

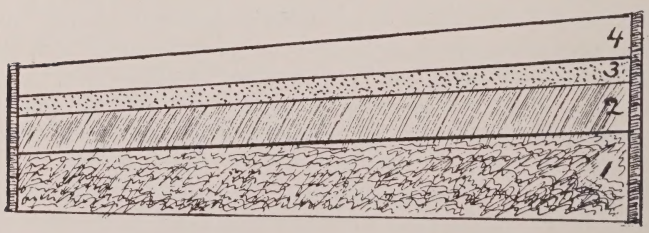


Figure 21—Section through propagating frame
1—Layer of well decayed leafmold, 9 inches deep; 2—Prepared soil mixture, 4 inches deep; 3—Coarse sand, 1 inch deep; 4—Space between glass and layer of sand, 4 inches deep

Figure 22—Young growth suitable for heel cutting

A cutting frame such as described will grow almost all rock plants, at least those best known to a beginner.

Cuttings

Neither mystery nor extraordinary skill is involved in propagating a great majority of rock plants. The adherence to a few simple rules and the possession of a sharp knife will give one all the plants needed. Generally the best time to take cuttings is in early Summer when the young growths, made during the Spring, are half ripe.

When it is possible to do so, take each cutting with a heel—that portion where it is attached to the parent plant. (See Figure 22.)

The cuttings should be taken when they are about two inches long. If, however, the propagator leaves over the operation until the growths are several inches in length, he will then have to use joint cuttings, taken at a joint or node—that part where the leaves are attached to the stem of the young growth. (See Figure 23.)

It is preferable to take cuttings with heels, as these usually root more readily than joint cuttings.

As the cuttings are taken they should be prepared for the propagating frame, where they are to be inserted and developed into individual plants.

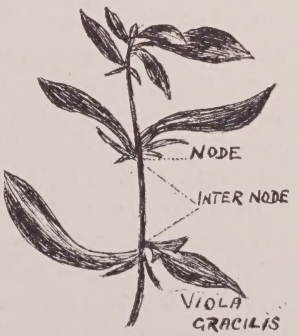


Figure 23—Growth suitable for joint cutting

In taking the type of cutting with a heel, as the young growth is severed from a stem or base of the plant, by simply pulling it down until released, it takes with it a minute portion of the parent attached to what is termed the "heel." This and a few leaves from the base—usually two pairs—must be cut away clean from the stem, this point later to emit the roots.

The type of cutting taken from a joint can be made in some cases at the convenient size of two inches, but there are subjects that measure almost that distance between their leaves; and in such instances only one pair of leaves can be cut off, the roots' emission occurring at this place.

The following diagram shows different types of cuttings taken from various plants. (See Figure 24.)

The cuttings should be set out about one inch apart in the line and two inches between the rows; but the propagator should be guided by the actual subject, whether or not it is leafy. Each cutting should be buried to the depth of its first pair of leaves and made quite firm.

When all are inserted they should be given a good soaking, which not only will give the cuttings a further tightening, but will work the sand into the holes made by the dibber and will leave the surface even.

During the heat of the day the frame should be shaded, either by color wash smeared on the glass or by cheesecloth. The latter has an advantage, for it can be removed in the evening when the sun has gone done and also on cloudy days.

For the first few days the frame should be kept closed, to exclude air, and the cuttings sprayed frequently during the day, according to weather conditions—not watered but merely sprayed sufficiently to keep the leaves from wilting.

Whatever water collects on the glass inside of the frame, due to evaporation, should be wiped off.

When it is noticed that the cuttings have begun to make growth by sending forth new shoots from the leaf axil, air should be admitted into the frame by degrees and increased according to the stage of growth.

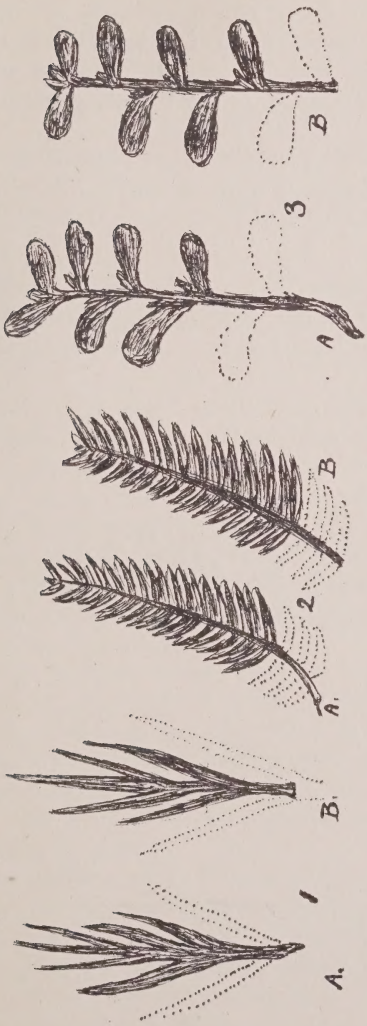


Figure 24—Cuttings ready to insert: 1—Dianthus caesius; 2—Phlox subulata; 3—Aubrietia. "A" in each case represents heel cutting; "B" joint cutting

The center of the cutting—just the tip—may be pinched out in order to induce lateral growth and make a bushy plant.

As the young plants develop into considerable size, the glass may be taken off and their growth continued until they are large enough to be potted or planted straightway into the rock garden.

Propagating one's own plants is an intensely interesting work and may be undertaken by the beginner with every promise of success.

Chapter VI

Bulbs for the Rock Garden

THE inclusion of bulbs adds greatly to the interest of a rock garden in view of their early flowering, and in a few instances at a time when the actual rock plants have not awakened to activity.

The first to flower are the Snowdrops (Galanthus), Winter-aconite (Eranthis hyemalis), and the Chionodoxa (Glory-of-the-snow), which send forth their leaves and flowers where the sun has melted the snow, even though the surroundings may appear to be still in Winter's grasp.

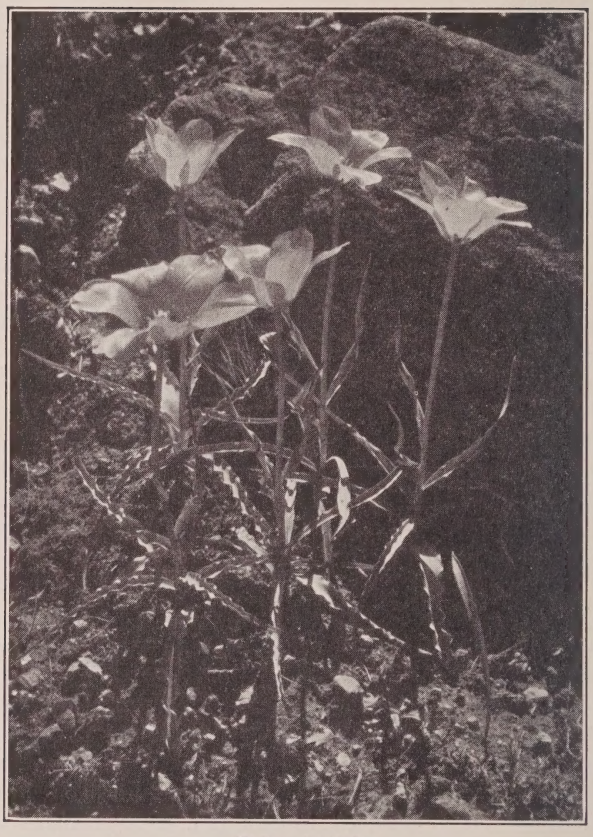
As the snow entirely disappears and there are definite signs of the approach of Spring, so the Scillas and Crocus make progress in opening their flowers, shortly followed by the Tulips, Narcissus, and soon the Muscari.

Then, with the warm Spring rains, the rock plants rapidly make growth and presently the garden is one mass of color.

Considering how many beautiful bulbs, varying considerably in hue, stature and purchase price, may be grown in the rock garden, there is no difficulty in making a selection that will be in keeping with the size of one's garden, one's means, or an individual taste for color.

Where one might consider Tulipa greigi, with its fiery red flowers and curiously mottled leaves, too large for a small rock garden, preference would probably be given to Tulipa linifolia, a positive gem whose small scarlet flowers and narrow, grayish-green leaves never fail to claim admiration.

In general, the bulbs should be planted in a well drained soil in a sunny situation where they can be left undisturbed from



Tulipa linifolia

One of the most dainty and appropriate Tulip species for a small rock garden. The scarlet flowers, carried on thin stems, with crimpled foliage, are especially attractive when in full bud—just before expanding. For effect, plant in small colonies at the base of a rock, in sandy soil. T. linifolia is by no means common, and can be purchased at some of the leading bulb houses

year to year to multiply. The Tulip species (botanical Tulips) would greatly benefit by being dug from the ground each year, when their leaves are turning yellow, ripened, and planted again in September.

In planting the more expensive Tulips, it is advisable to place a depth of sand at the bottom of the hole, which will prevent an accumulation of water, thus overcoming any possibility of the bulb rotting.

Where it can be practiced, plant the cheaper kinds of bulbs in bold drifts under a ground cover, such as Phlox subulata or Aubrietias—not for economy of space but for the green setting the ground cover affords. In so doing one should ascertain whether or not the ground cover and bulb will flower at the same time, in case their colors do not harmonize.

The more expensive bulbs could be planted in little colonies of their own, in a situation where they may be viewed to advantage

Narcissus cyclamineus, N. triandrus albus and N. triandrus calathinus look particularly well when planted at the base of a rock, so that the flowers are silhouetted against the rock's face.

The following is a selection of bulbs suitable for either a small or a large rock garden:

PLANT THREE INCHES DEEP:

Crocus aureus.....Orange yellow
Crocus imperati.....Mauve; Autumn flowering
Crocus sieberi.....Lilac
Crocus speciosus.....Blue; Autumn flowering
Crocus susianus.....Orange, brown markings
Crocus tomassinianus.....Lavender white
Crocus versicolor.....Purple and white
Crocus zonatus.....Rosy lilac; Autumn flowering
Chionodoxa (Glory-of-the-snow):
Chionodoxa gigantea.....Pale blue, white center
Chionodoxa luciliae.....Sky blue and white
Chionodoxa sardensis....Deep blue; one of the most charming of the Spring bulbs

PLANT SIX INCHES DEEP:

Galanthus (Snowdrop):
Galanthus elwesi.....Large pure white flowers
Galanthus nivalis fl. pl.....The double Snowdrop

Iris gracilipes

A dainty Iris for the rock garden, not exceeding 9 inches in height. The thin, wiry stems are much branched, and during May bear flowers of pale lavender with a distinct yellow crest. The grasslike foliage is light green. Plant in a sunny situation, in a good depth of loam, with an addition of well decayed manure.

PLANT TWO INCHES DEEP:

Eranthis (Winter Aconite):

Eranthis cilicica.....Yellow

Eranthis hyemalis. Golden yellow; the first to flower in Spring

PLANT THREE INCHES DEEP:

Muscari botryoides.....Blue

Muscari botryoides album.....White

Muscari botryoides, Heavenly Blue.....Deep sky blue

Muscari racemosum.....Dark violet

Any of the foregoing genera are inexpensive. They should be planted in drifts for effect.

PLANT THREE INCHES DEEP:

Narcissus odorus campernelli.....Yellow

Narcissus cyclamineus.....Yellow

Narcissus triandrus albus (Angels Tears).....Creamy white

Narcissus triandrus calathinus.....White

PLANT FOUR INCHES DEEP:
Narcissus johnstoni (Queen of Spain).....Yellow

PLANT TWO INCHES DEEP:
Narcissus bulbocodium.....Yellow

PLANT TWO INCHES DEEP:
Narcissus bulbocodium citrinus.....Lemon yellow

PLANT THREE INCHES DEEP:
Narcissus minimus.....Yellow (smallest of all Daffodils)

PLANT THREE INCHES DEEP:
Narcissus minor.....Yellow

Narcissus cyclamineus in a Rock Garden
Courtesy John Scheepers, Inc.

Narcissus triandrus albus
Courtesy John Scheepers, Inc.

Those last named are higher priced than the preceding list and would probably be purchased in small quantities of six or ten. They should be planted in small groupings where they can be seen to best advantage, the ground for their reception being made light and open by mixing with it coarse sand.

Tulipa australis. Yellow, flushed red; star-shaped; 16 in. high.

T. clusiana (The Lady Tulip). Inner petals creamy white with violet base; outer petals cherry red; 12 to 14 in. high.

T. echleri. Bright scarlet; base of petal dark brown; 12 in. high.

Narcissus minor

This delightfully diminutive Daffodil, whose stature does not exceed 6 inches, for beauty in miniature is worthy of a situation in the foregrounds of small or large rock gardens, planted in colonies according to the size of the garden. As the snow melts and the warmth of the sun increases, they become impatient to send forth their leaves and flower stems, which increase to their maximum growth while the yellow flowers are fully expanding to herald the arrival of Spring

T. kaufmanniana. Inside of flower white, with yellow base; 8 in. high.

T. greigi. Fiery red, black at base of petal with yellow marking; 9 in. high.

T. dasystemon. Yellow edged white; 6 in. high.

T. linifolia. Scarlet—a real gem in miniature; 8 in. high.

T. praestans. Orange scarlet, leaves covered with minute hairs.

T. violacea. Violet red; 4 in. high.

T. vitellina. Pale yellow; fragrant; 12 in. high.

T. montana. Carmine red, black center; 5 in. high.

T. oculus-solis. Bright red; dark blotch bordered yellow at base of petal; 14 in. high.

The above to be planted to a depth of six inches.

The botanical Tulips have a wide range of color, shape of flower, height, and flowering season. Their beauty of flower is worthy of the extra care in planting and the period of rest afforded them after flowering. Most of these Tulips are comparatively high priced as compared with the charge made for ordinary garden Tulips. Practically all of the varieties of bulbs mentioned can be purchased at the leading bulb houses in the United States.

Chapter VII

Small Coniferous Evergreens for the Rock Garden

SLOW growing evergreens are a valuable addition to the rock garden and help considerably to make the whole more interesting. A selection suitable for planting on a small rock garden is limited, and unless slow growing varieties are chosen, others in a few years will command too much space and removal will become necessary.

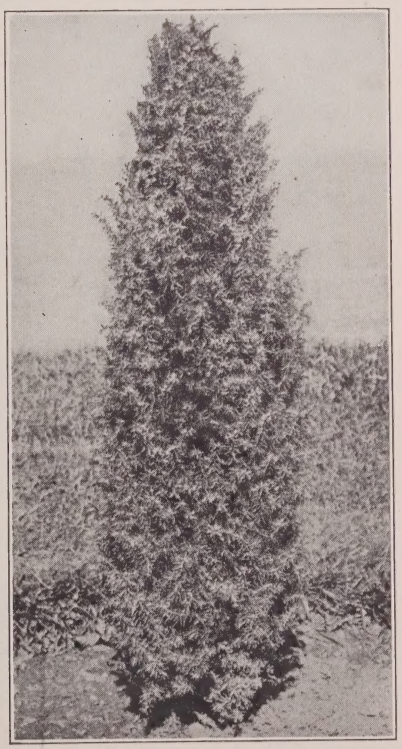
The following are perfectly hardy and can be purchased from nurseries growing general stock or from those specializing in evergreens:

Picea glauca conica

A small Spruce forming a compact cone. The young shoots in the Spring are bright green, contrasting with the darker green of previous year's growth. Ideal for rock work.

Picea excelsa clanbrasiliana

Another little dense, vivid green Spruce fitting closely to the ground and forming a flattened mass of short, crowded branchlets.



Juniperus communis suecica

Picea excelsa gregoryana

Flat and cushionlike, somewhat similar to the foregoing, rarely attaining a height of 2 feet.

Pinus strobus nana

Dwarf, roundish form of the common White Pine.

Chamaecyparis obtusa nana

A dwarf form of the Hinoki Cypress with characteristic dark green foliage. Slow growing and very attractive.

Thuja occidentalis, Little Gem

A good evergreen for a small rock garden. A diminutive Arborvitae, compact and of roundish appearance.

Picea glauca conica

A small, slow growing Spruce, forming a compact cone. Ideal for rock work

Thuja occidentalis Little Gem

Juniperus communis suecica
Compact, upright evergreen. Although a quick and somewhat taller grower, its pyramidal stature is most attractive.

Juniperus virginiana globosa
A compact, spherical form of the Redcedar.

Juniperus chinensis sargenti
A prostrate Juniper with dark green leaves, useful as a ground cover.

Chapter VIII

Flowering Shrubs for Use in the Formation of a Background

THE following flowering shrubs vary considerably in height; therefore, should be planted with an allowance of sufficient space for their full development. They may be planted singly or in effective groupings, according to the size of the rock garden and the distance available for the background.

Azalea obtusa amoena

A pretty, semi-evergreen Azalea with a mass of purple-red flowers in May. Attains a height of 4 or 5 feet and is best suited in a peaty soil.

Azalea obtusa kaempferi

The "Flame Azalea." Bright red flowers of similar habit to the preceding.

Cotoneaster divaricata

Attractive for its mass of red berries in the Autumn. Makes a bush of 5 feet in height and of equal breadth. Will thrive in any good soil.

Lonicera syringantha

A sweetly scented Bush-honeysuckle bearing a profusion of pink flowers in May. A roundish shrub of 4 or 5 feet in height.

Lonicera tatarica

Another Honeysuckle, growing 8 or 9 feet tall. The pink flowers are followed by conspicuous red berries.

Spiraea trichocarpa

One of the best white Spiraeas, 6 or 7 feet high, bearing arched sprays of flowers.

Spiraea arguta

A dainty subject of somewhat smaller growth than the preceding. The slender branches bear a profusion of single white flowers in May.

Deutzia gracilis

One of the most popular Deutzias. Height 3 to 4 feet. Flowers white.

Deutzia lemoinei

Taller growing and bearing larger white flowers. Will flourish in any good garden soil.

Deutzia lemoinei

Viburnum carlesi

A beautiful subject. In May its pale pink flower clusters are delightfully fragrant. 4 to 5 feet high. Likes a moist, rich soil.

Viburnum dilatatum

The Linden Viburnum. In the Autumn a scarlet cloud of berries. Attains a height of 8 feet.

Forsythia spectabilis

One of the best "Golden Bells." Deep yellow, forming a spreading bush of 7 or 8 feet in height and nearly as much breadth.

Philadelphus Virginal

A justly popular Mockorange, with large white, fragrant flowers. 7 to 8 feet high.

Diervilla, Eva Rathke

A handsome, red-flowering Weigela. Likes to be planted in a good soil, where it will attain a height of 5 to 6 feet.

All of the foregoing flowering shrubs are hardy, deciduous, and can be easily purchased in various heights.

Berberis julianae

A Chinese Barberry whose long, deep green leaves retain their color throughout the Winter. It makes a round, compact bush, 4 to 5 feet high, and bears blue-black fruit.

Kalmia latifolia

The Mountain-laurel. A beautiful hardy native with dark gray foliage and pink flowers. June. Grows 5 to 7 feet high, and, like the two following, prefers a peaty soil.

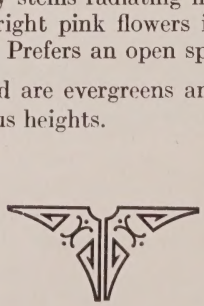
Pieris floribunda

Good, hardy evergreen, making a roundish bush of 4 feet or so in diameter and bearing a profusion of little waxy-white flowers in May.

Rhododendron carolinianum

Although of compact and bushy habit, it is actually composed of many long, straggly stems radiating in all directions from a main stock. Bears bright pink flowers in May and attains a height of 4 to 5 feet. Prefers an open space.

The last four named are evergreens and likewise may easily be purchased in various heights.



Chapter IX

Trees Suitable for a Background

AFTER the flowering shrubs have been set out, where space is available for further background planting, consideration may be given to flowering trees, the use of which should not be overdone by crowding to give immediate effect or possibly to shut from view some undesirable structure.

The trees should be planted with a knowledge of the heights and widths of the different subjects on approaching maturity. Further, their time of flowering and color should be considered, lest the flowering shrubs below and immediately surrounding, blossom at the same time and perhaps do not harmonize in color.

The extent in width of the planting which forms the background should not exceed that of the rock garden, or proportion and balance will soon be lost, and, instead of the rock garden being the main feature, the background would tend to detract through occupying more ground. The rock garden is the picture itself and should receive primary consideration, the frame or background, when in proportion and well balanced, lending a dignified and seclusive appearance to the completed picture.

Cornus florida rubra

A red form of the native flowering Dogwood. Is very showy and worthy of a situation where it can be viewed to advantage. It attains 15 to 20 feet in height on maturity.

Prunus cerasifera pissardi (The Purple Leaf Plum).

Notable for its characteristic foliage and little pink flowers. It grows from 12 to 14 feet high.

Prunus subhirtella pendula (Weeping Japanese Cherry)

A picture in May, a mass of pink blossoms. 12 to 15 feet in height.

Flowering Crab

Prunus serrulata, Fugenzo

Most handsome of Japanese Cherries, has large, double, rose pink flowers. It attains a height of 30 to 35 feet; of somewhat upright habit.

Amelanchier canadensis

The Native Shadblow, growing 12 to 15 feet in height. The flowers of snowy whiteness are a picture in May.

Malus ioensis plena (Bechtel Crab).

Has large, double pink flowers on long stalks, and grows 10 to 14 feet high.

Malus floribunda

One of the Japanese flowering Crabs. A mass of pink and white in Spring, followed by quantities of yellow fruit.

Chapter X

Easily Grown Rock Plants

IN most hardy plant catalogs there are enumerated a goodly number of easily grown rock plants, sufficient to furnish a rock garden of dimensions that the enthusiast would probably undertake to build for himself, and then, as the outcome of his success, he might consider growing some of the rarer varieties as cataloged by the few specialists, or even more interesting, he might raise his own plants from seed.

The following listed plants, as contained in the principal catalogs, are all desirable acquisitions. They can be purchased at moderate cost, are perfectly hardy and all are free flowering. These plants will thrive in an ordinary soil mixture and are best suited to a sunny situation, unless otherwise stated.

Name	Color	Height or Habit	Flowering Period
Alyssum alpestre	Yellow	4 in.	June-July
saxtile compactum	Golden Yellow	12 in.	April-May
saxatile citrinum	Pale Yellow	6 to 12 in.	April-May
Androsace lanuginosa	Pink; silvery foliage	Trailer	May-Oct.
Anemone pulsatilla	Violet blue, bright yellow stamens	12 in.	April-May
Aquilegia caerulea	Blue and white	6 to 10 in.	May-July
glandulosa	Blue and white	6 to 10 in.	May-July
Arabis albida	White	6 in.	Spring
albida fl. pl	Double white, most showy	6 in.	Spring
Arenaria montana	White	12 in.	June-Aug.
Aster alpinus	Blue	6 in.	June-July
alpinus albus	White	6 in.	June-July
Mauve Cushion	Mauve	9 in., compact	Sept.-Oct.
subcaeruleus	Violet blue	9 in.	June-July

Name	Color	Height or Habit	Flowering Period
Aubrietias in var	Various colors	4 in.	Spring
Crucianella stylosa	Pink	6 in.	May-Sept.
Campanula carpatica	Pale blue	9 to 12 in.	July-Aug.
carpatica alba	White	9 to 12 in.	July-Aug.
turbinata	Blue	6 in.	Spring
pusilla	Blue	4 to 6 in.	June-July
pusilla alba	White	4 to 6 in.	June-July
muralis	Blue	4 to 6 in.	June-July

Alyssum saxatile compactum

An easy, free growing subject for rock or wall garden. Flowers are yellow, blooming in May. Thrives in an ordinary soil in a sunny situation

Arenaria montana

Of all the Arenarias, A. montana is the most showy, and it is particularly effective when planted in bold masses at the foot of the rockwork, or above a rock where it may grow freely for a distance of the rock's depth without intruding upon a neighbor's territory. Plant in a sunny situation in an assured depth of sandy loam. In May and June the plant is covered with numerous flowers of dazzling whiteness

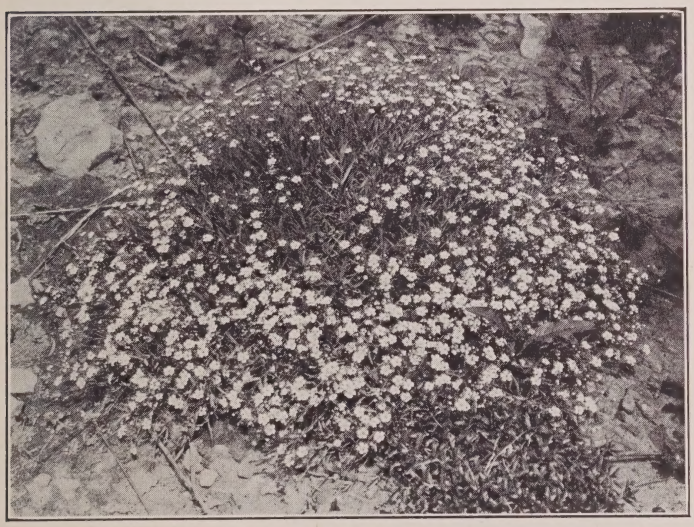
Name	Color	Height or Habit	Flowering Period
CAMPANULA—Continued			
garganica	Pale blue	Trailer	July-Sept.
rotundifolia	Scotch Bluebell	6 to 8 in.	Aug.-Sept.
Dianthus caesius	Rose pink	6 in.	Summer
caesius fl. pl.	Double rose pink	6 in.	Summer
deltoides	Pink	Trailer	Summer
deltoides, var. Brilliant	Deep pink	Trailer	Summer
plumarius (in varieties)	Various colors	12 in.	Summer
plumarius var. Annie Laurie	Pink, dark center	12 in.	Summer
Dicentra eximia	Pink, attractive foliage	12 in.	June
Epimedium luteum	Yellow	12 in.	April-May
Erigeron caucasicus	Rosy lilac	6 in.	June-July

Dianthus deltoides — Dianthus plumarius

Both fine, hardy rockery plants

Name	Color	Height or Habit	Flowering Period
Erinus alpinus	Pink	6 in.	May-July
Erysimum pulchellum	Yellow	6 in.	May-Aug.
Galium verum	Yellow	9 in.	June-July
Gypsophila repens	White	Trailer	July-Aug.
Helianthemums	In various colors	6 in.	June-Aug.
Heuchera brizoides	Bright red bells on slender stems	12 in.	July
Hypericum reptans	Golden yellow	Trailer	Summer
Iberis sempervirens	White, evergreen	9 in.	Spring
Iris pumila	Blue	9 in.	April-May
pumila var. alba	White	9 in.	April-May
pumila var. lutea	Yellow	9 in.	April-May
pumila var. Orange Queen	Bright Yellow	9 in.	April-May
Leontopodium alpinum (*Edelweiss*)	Woolly flowers	6 to 9 in.	June-July
Linum flavum	Yellow	6 in.	June-Aug.
perenne	Pale blue	12 in.	June-Aug.
Lychnis alpina	Pink	4 in.	June-Aug.
lagascae	Pink	4 in.	May-June
viscaria alba	White	9 in.	Summer
Lysimachia nummularia (for shade)	Yellow	Trailer	Summer

Name	Color	Height or Habit	Flowering Period
Mentha requieni	Minute blue flowers; foliage peppermint scented	Creeping close to ground	Summer
Mertensia virginica (for damp situation)	Pale blue	18 in.	Spring
Myosotis alpestris var. Victoria	Bright blue	6 in.	May-June
Nepeta mussini	Violet blue, foliage gray	12 to 18 in.	Summer
Oenothera youngi	Golden yellow	12 in.	Summer
Papaver alpinum	White, Orange	6 in.	May-Sept.
nudicaule	Orange, yellow, white	18 in.	Summer



Gypsophila prostrata

Members of this genus are especially useful in the rock garden. The beautiful Gypsophila prostrata commences to flower when the main showing of the Spring is over. The plants are mostly deep rooting and require an assured depth of sandy loam, in a sunny situation. For preference, plant in a sloping pocket where the plants may be viewed to advantage, or in a crevice, permitting the prostrate growth to overhang the rock. The tiny, starlike flowers are white, and the foliage a glaucous green

Phlox subulata Vivid

Few genera in the rock garden possess so many distinct colors as the ground Phlox, and probably none are better known to hardy plant lovers. Their colors range from pure white with a yellow eye (P. s. nelsoni) to light mauve (P. s. lilacina), pale blue (P. s. G. F. Wilson), and a clear pink (P. s. Vivid). The last named, unlike all of the foregoing, forms neat tufts in contrast to the trailing nature of the others. Plant in a sunny situation, in an ordinary sandy soil, and, where possible, in masses for effect. All varieties flower during May

Name	Color	Height or Habit	Flowering Period
PAPAVER—Continued			
nudicaule, var. Tangerine	Bright orange, numerous yellow stamens	18 in.	Summer
Phlox amoena (American Phlox)	Bright pink	8 in.	Spring and Summer
divaricata (for shade)	Pale blue	18 in.	Spring
divaricata var. alba (for shade)	White	18 in.	Spring

Name	Color	Height or Habit	Flowering Period
PHLOX—Continued			
subulata, var. Apple Blossom	Pale Pink	Trailer	Spring
subulata, var. G. F. Wilson	Dark lavender (best of its color)	Trailer	Spring
subulata lilacina	Pale lavender	Trailer	Spring
subulata nelsoni	Pure white	Trailer	Spring
subulata rosea	Bright rose	Trailer	Spring
subulata, Vivid	A clear pink; forms neat tufts; best of pink varieties	Trailer	Spring
Polemonium reptans	Pale blue	12 in.	May-July
Primula denticulata	Lilac	9 to 12 in.	Spring
denticulata alba	White	9 to 12 in.	Spring
denticulata cachemiriana	Lilac purple	9 to 12 in.	Spring
polyantha (polyanthus)	Mixed colors	Grow in partial shade	Spring
polyantha (Munstead Strain)	Large flowers in various shades	Grow in partial shade	Spring
Prunella webbiana (shade)	Rosy purple	6 in.	July-Aug.
Saponaria ocymoides	Rosy pink	Trailer	Summer
Saxifraga macnabiana	Creamy white; crimson spots; leaves formed in rosettes; flower spike	12 to 18 in.	June
Sedums. Seven distinct varieties are described on page 26.			Summer
Sempervivums. Six distinct varieties are described on page 29.			"
Silene acaulis	Rose purple	2 in.	July
alpestris	White	6 in.	June-July
maritima	White	Trailing	Summer
maritima fl. pl.	Double white	Trailing	Summer
pennsylvanica (native)	Pink	4 in.	May
schafta	Bright pink	6 in.	July-Aug.
Statice armeria laucheana	Bright pink	Dense mat of green	June
armeria	Pink	Dense mat of green	June
Thymus. Five varieties described on page 47.			June-Aug.
Tunica saxifraga	Pink	Trailer	May

Name	Color	Height or Habit	Flowering Period
Veronica repens alba	White	1 in.	April-Aug.
teucrium prostrata	Blue	Trailer	June-July
teucrium rupestris	Blue	Trailer	June-July
Vinca minor	Blue	Trailer	June-Sept.
minor alba	White	Trailer	June-Sept.
Viola bosniaca	Rosy purple	3 in.	April-Aug.
Bowles Black	Black, yellow eye	4 in.	April-Aug.
cornuta	Blue	6 in.	April-Aug.
cornuta alba	White	6 in.	April-Aug.
florarensis	Pale blue, lighter towards center	6 in.	April-Aug.
Haslemere	Lilac pink	4 in.	April-Aug.
gracilis	Dark blue, white eye	Tufted	April-Aug.
gracilis alba	White, larger flower than above	Tufted	April-Aug.
gracilis lutea	Yellow; very floriferous	Tufted	April-Aug.
Jersey Gem	Rich purple, one of the best in the genera	Tufted	April-Aug.
Jersey Jewel	Reddish purple	Tufted	April-Aug

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